1. Subbasin Assessment – Watershed Characterization

The federal Clean Water Act (CWA) requires that states and tribes restore and maintain the chemical, physical, and biological integrity of the nation's waters (33 USC § 1251.101). States and tribes, pursuant to Section 303 of the CWA are to adopt water quality standards necessary to protect fish, shellfish, and wildlife while providing for recreation in and on the waters whenever possible. Section 303(d) of the CWA establishes requirements for states and tribes to identify and prioritize water bodies that are water quality limited (i.e., water bodies that do not meet water quality standards). States and tribes must periodically publish a priority list of impaired waters, currently every two years. For waters identified on this list, states and tribes must develop a total maximum daily load (TMDL) for the pollutants, set at a level to achieve water quality standards. This document addresses the water bodies in the St. Joe River subbasin that have been placed on what is known as the "303(d) list."

The overall purpose of this subbasin assessment and TMDL is to characterize and document pollutant loads within the St. Joe River subbasin. The first portion of this document, the subbasin assessment, is partitioned into four major sections: watershed characterization, water quality concerns and status, pollutant source inventory, and a summary of past and present pollution control efforts (Chapters 1 – 4). This information will then be used to develop a TMDL for each pollutant of concern for the St. Joe River subbasin (Chapter 5).

1.1 Introduction

In 1972, Congress passed public law 92-500, the Federal Water Pollution Control Act, more commonly called the Clean Water Act. The goal of this act was to "restore and maintain the chemical, physical, and biological integrity of the Nation's waters" (Water Pollution Control Federation 1987). The act and the programs it has generated have changed over the years as experience and perceptions of water quality have changed. The CWA has been amended 15 times, most significantly in 1977, 1981, and 1987. One of the goals of the 1977 amendment was protecting and managing waters to insure "swimmable and fishable" conditions. This goal, along with a 1972 goal to restore and maintain chemical, physical, and biological integrity, relates water quality with more than just chemistry.

Background

The federal government, through the U.S. Environmental Protection Agency (EPA), assumed the dominant role in defining and directing water pollution control programs across the country. The Department of Environmental Quality (DEQ) implements the CWA in Idaho, while the EPA oversees Idaho and certifies the fulfillment of CWA requirements and responsibilities.

Section 303 of the CWA requires DEQ to adopt, with EPA approval, water quality standards and to review those standards every three years. Additionally, DEQ must monitor waters to identify those not meeting water quality standards. For those waters not meeting standards, DEQ must establish TMDLs for each pollutant impairing the waters. Further, the agency must set appropriate controls to restore water quality and allow the water bodies to meet their designated uses. These requirements result in a list of impaired waters, called the "303(d) list." This list describes water bodies not meeting water quality standards. Waters identified on this list require further analysis. A subbasin assessment and TMDL provide a summary of the water quality status and allowable TMDL for water bodies on the 303(d) list. *St. Joe River Subbasin Assessment and TMDLs* provides this summary for the currently listed waters in the St. Joe River subbasin.

The subbasin assessment section of this report (Chapters 1 – 4) includes an evaluation and summary of the current water quality status, pollutant sources, and control actions in the St. Joe River subbasin to date. While this assessment is not a requirement of the TMDL, DEQ performs the assessment to ensure impairment listings are up to date and accurate. The TMDL is a plan to improve water quality by limiting pollutant loads. Specifically, a TMDL is an estimation of the maximum pollutant amount that can be present in a water body and still allow that water body to meet water quality standards (40 CFR, Part 130). Consequently, a TMDL is water body- and pollutant-specific. The TMDL also includes individual pollutant allocations among various sources discharging the pollutant. The EPA considers certain unnatural conditions, such as flow alteration, a lack of flow, or habitat alteration, that are not the result of the discharge of a specific pollutants as "pollution." A TMDL is not required for a water body impaired by pollution, but not specific pollutants. In common usage, a TMDL also refers to the written document that contains the statement of loads and supporting analyses, often incorporating TMDLs for several water bodies and/or pollutants within a given watershed.

Idaho's Role

Idaho adopts water quality standards to protect public health and welfare, enhance the quality of water, and protect biological integrity. A water quality standard defines the goals of a water body by designating the use or uses for the water, setting criteria necessary to protect those uses, and preventing degradation of water quality through antidegradation provisions.

The state may assign or designate beneficial uses for particular Idaho water bodies to support. These beneficial uses are identified in the Idaho water quality standards and include:

- Aquatic life support – cold water, seasonal cold water, warm water, and salmonid spawning

- Contact recreation – primary (swimming), secondary (boating)

- Water supply – domestic, agricultural, industrial

- Wildlife habitats, aesthetics

The Idaho legislature designates uses for water bodies. Industrial water supply, wildlife habitat, and aesthetics are designated beneficial uses for all water bodies in the state. If a water body is unclassified, then cold water and primary contact recreation are used as additional default designated uses when water bodies are assessed.

A subbasin assessment entails analyzing and integrating multiple types of water body data, such as biological, physical/chemical, and landscape data to address several objectives:

-- Determine the degree of designated beneficial use support of the water body (i.e., attaining or not attaining water quality standards).

-- Determine the degree of achievement of biological integrity.

-- Compile descriptive information about the water body, particularly the identity and location of pollutant sources.

-- When water bodies are not attaining water quality standards, determine the causes and extent of the impairment.

The St. Joe River subbasin (Hydrologic Unit Code 17010304) is a large watershed composed of both the St. Joe River and the St. Maries River. The primary land uses of the St. Joe River subbasin are forestry and recreation, while considerably more agriculture and garnet mining occur along the St. Maries River. The lower St. Joe River watershed lies within the Coeur d'Alene Reservation boundary. For the purposes of scheduling, assessment of the St. Joe River portion of the watershed was begun in 2000, while the assessment of the St. Maries River portion occurred in the year 2001. The current assessment deals with those water quality limited segments that are tributaries to the St. Joe River, except the St. Maries River and Benewah Creek. Benewah Creek is located within the boundary of the Coeur d'Alene Reservation. Development of a TMDL for Benewah Creek falls under the jurisdiction of the EPA. The St. Maries River is addressed in St. Maries River Subbasin Assessment and Total Maximum Daily Loads (DEQ 2002).

1.2 Physical and Biological Characteristics

The St. Joe River and its tributaries drain the entire watershed above the confluence with the St. Maries River at the city of St. Maries (Figure 1; section 303(d) listed water bodies are highlighted in blue). The river drains the southern slopes of the St. Joe Mountains, the western slope of the Bitterroot Range and the northern slopes of the Clearwater Mountains. The watershed encompasses 1,192 square miles above St. Maries, Idaho.

Climate

Northern Idaho is located in the Northern Rocky Mountain physiographic region to the west of the Bitterroot Range. The St. Joe and Clearwater Mountains, which the St. Joe River drains, are a part of the Bitterroot Range. The local climate is influenced by Pacific maritime air masses from the west, as well as continental air masses from Canada to the north and the Great Basin to the south. The annual weather cycle generally consists of cool to warm summers with cold and wet winters. The relative warmth of winters depends on the dominance of the warmer, wetter Pacific or cooler dryer continental air masses. The relative warmth of summers depends on the dominance of the warmer, dryer Great Basin or cooler wetter Pacific air masses. Precipitation is greatest during the winter months.

For the city of St. Maries for a period of record from 1897 to 2001, the average annual maximum temperature was 59.6 ^{o}F and the average annual minimum temperature was 35.5 ^{o}F (Inside Idaho 2002). For the same time period, the month with the lowest average maximum (49.3 ^{o}F) and lowest average minimum (22.2 ^{o}F) temperature was January. July had the highest average annual minimum temperature (34.8 ^{o}F) and the highest average annual maximum temperature (84.8 ^{o}F). For the town of Avery for a period of record from 1968 to 2001, the average annual maximum temperature was 57.0 ^{o}F and the average annual minimum temperature was 35.6 ^{o}F (Inside Idaho 2002). These temperatures were recorded at the United States Forest Service's Avery Ranger Station, built in 1968. For the same time period, the month with the lowest average maximum (30.2 ^{o}F) and lowest average minimum (20.6 ^{o}F) temperature was January. July had the highest average annual minimum temperature (49.4 ^{o}F) and August the highest average annual maximum temperature (83.7 ^{o}F). The Ranger station built in 1968 replaced an earlier ranger station at a different location. A weather station operated at the earlier Avery Ranger Station from 1913 to 1968. The average annual maximum temperature recorded at that station was 60.1 ^{o}F and the average annual minimum temperature was 34.2 ^{o}F. For the same time period, the month with the lowest average maximum (34.0 ^{o}F) and lowest average minimum (20.3 ^{o}F) temperature was January. July had the highest average annual minimum temperature (47.6 ^{o}F) and the highest average annual maximum temperature (80.0 ^{o}F).

Although intervening mountain ranges progressively dry the Pacific maritime air masses, these air masses deposit appreciable moisture primarily as snow on the St. Joe River watershed. Maritime air masses originating in the mid-Pacific are relatively warm, often yielding their precipitation as rain. The watershed is generally between 3,000 and 6,000 feet (915 and 1829 meters) in elevation with 47% of the watershed in the rain-on-snow elevation range of 3,300 to 4,500 feet (1006 and 1372 meters). Below 3,300 feet, the snow pack is transitory, while above 4,500 feet the snow pack is sufficiently cool that warming by a maritime front is insufficient to cause a significant thaw. In the rain-on-snow elevation range (3,300 - 4,500 feet), a heavy snow pack accumulates each winter. A warm maritime front can sufficiently warm the snow pack making it isothermal and capable of yielding large volumes of water to a runoff event. With 47% of the watershed in the rain-on-snow elevation range, it is less sensitive to high discharge episodes than watersheds with higher percentage of slopes in this zone.

Weather data from the city of St. Maries show that the 105-year average annual precipitation from 1897 to 2001 was 28.4 inches (Inside Idaho 2002). December exhibited the largest amount of precipitation at 3.93 inches and July the lowest amount of precipitation at 0.98 inches. Data from Avery show that the 34-year average annual precipitation from 1968 to 2001 was 37.6 inches. January exhibited the largest amount of precipitation at 5.83 inches and August the lowest amount of precipitation at 1.33 inches.

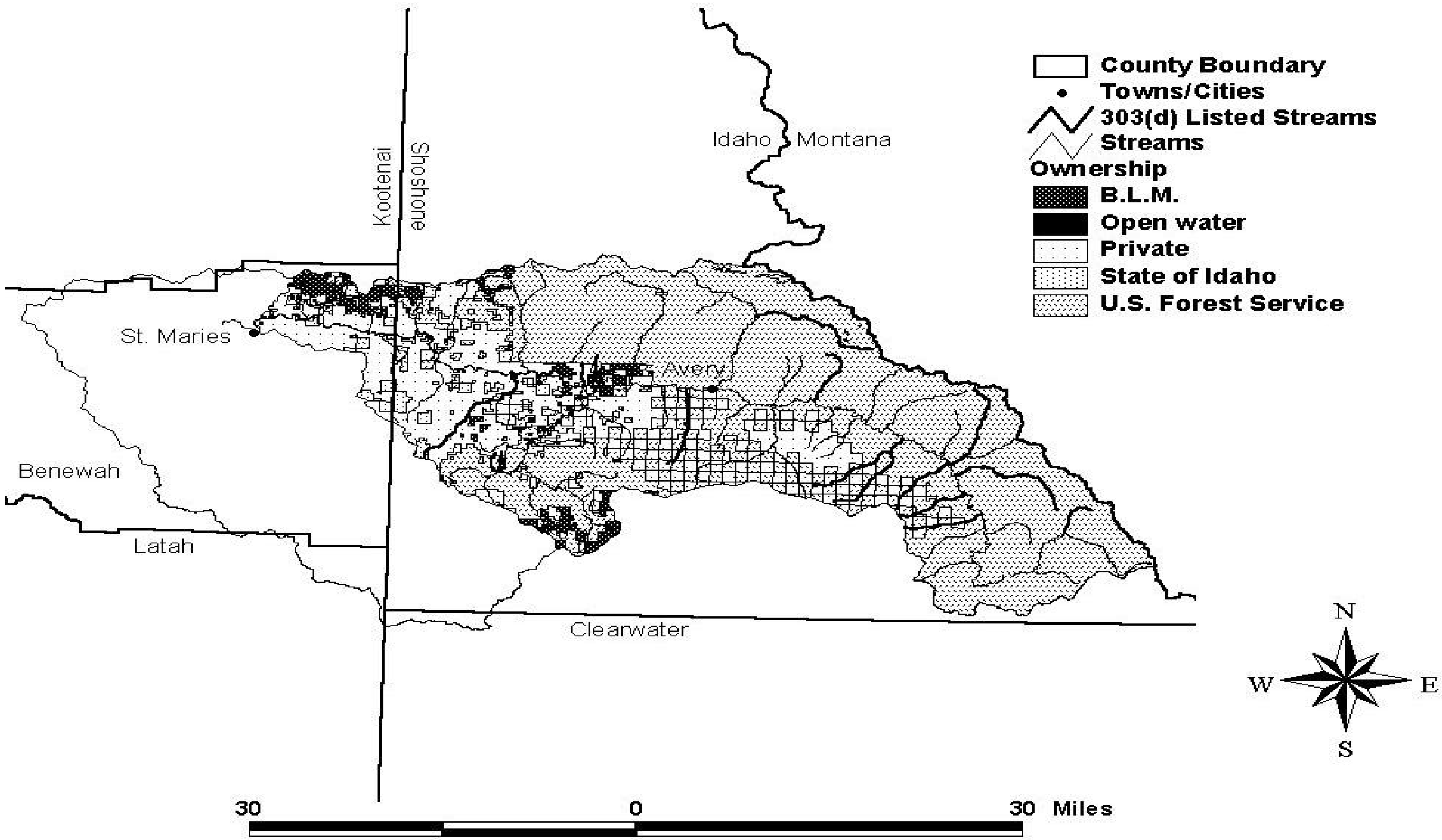

Figure 1. St. Joe River Subbasin

Subbasin Characteristics

The St. Joe River and its tributaries drain the entire watershed above the confluence with the St. Maries River at the city of St. Maries (Figure 1). The river drains the southern slopes of the St. Joe Mountains, the western slope of the Bitterroot Range, and the northern slopes of the Clearwater Mountains. The watershed encompasses 1,192 square miles above St. Maries, Idaho.

-- Hydrography

The U.S. Geological Survey (USGS) has continuously operated the Calder Gaging Station since July 1920. Weather stations have operated at the St. Maries Ranger Station in the city of St. Maries since 1897 and at two ranger stations near the town of Avery, one from 1913 to 1968 and the other since 1968 (Figure 2).

-- Geology and Soils

The St. Joe River drains the St. Joe and Clearwater Mountains, subsets of the Bitterroot Mountains. The mountains are primarily composed of metasedimentary rocks of the Proterozoic Belt Supergroup. Granitic intrusions exist in some areas. The largest of these is the Roundtop pluton located in the Fishhook and Sisters watersheds. Bottoms of steep valleys and gulches are composed of colluvial deposits. Unlike the Coeur d'Alene Mountains to the north, the St. Joe, Clearwater, and Bitterroot Mountains were glaciated, but not covered by ice sheets. In the broader floodplain of the lower St. Joe River, alluvial materials worked by the river comprise the valley bottoms. The lower reaches of the St. Joe River are located on lacustrine deposits of the Miocene Coeur d'Alene Lake. Several wetlands and a few lateral lakes occur in the lower river valley above the city of St. Maries.

The mountain slopes are generally underlain by silty to silt loam podsolic soils developed under cool conditions. Sandy granitic soils occur in the Roundtop area. Volcanic ash deposits are variably found in the soil mantle. The soil mantle is generally thin on slopes, with A and B horizons (topsoil and subsoil layers) of 3 to 4 inches. The soil mantle generally decreases with altitude. Soils in the bottom lands are commonly silty to sandy podsols developed under upland forests. Near streams and in some pockets, black mucky soils exist where red cedar (*Thuja plicata*) stands are the dominant vegetation.

-- Topography

The St. Joe River flows from east to the west to enter Coeur d'Alene Lake near Conkling Point. The ranges have high, massive mountains, and deep, dissected intermountain valleys. Valleys reach down to 2,200 feet while most mountains reach over 5,000 feet. Peaks on the Bitterroot Divide, and some Clearwater Mountains, range to well over 6,000 feet. The land is steep, but generally stable. Mass failures are not a typical feature of the land in this area, but are specific to a few land types located primarily on granitic land forms and in the valley bottoms. The aspect of the St. Joe River valley is generally west facing. Tributary valleys have a predominance of north and south facing aspects.

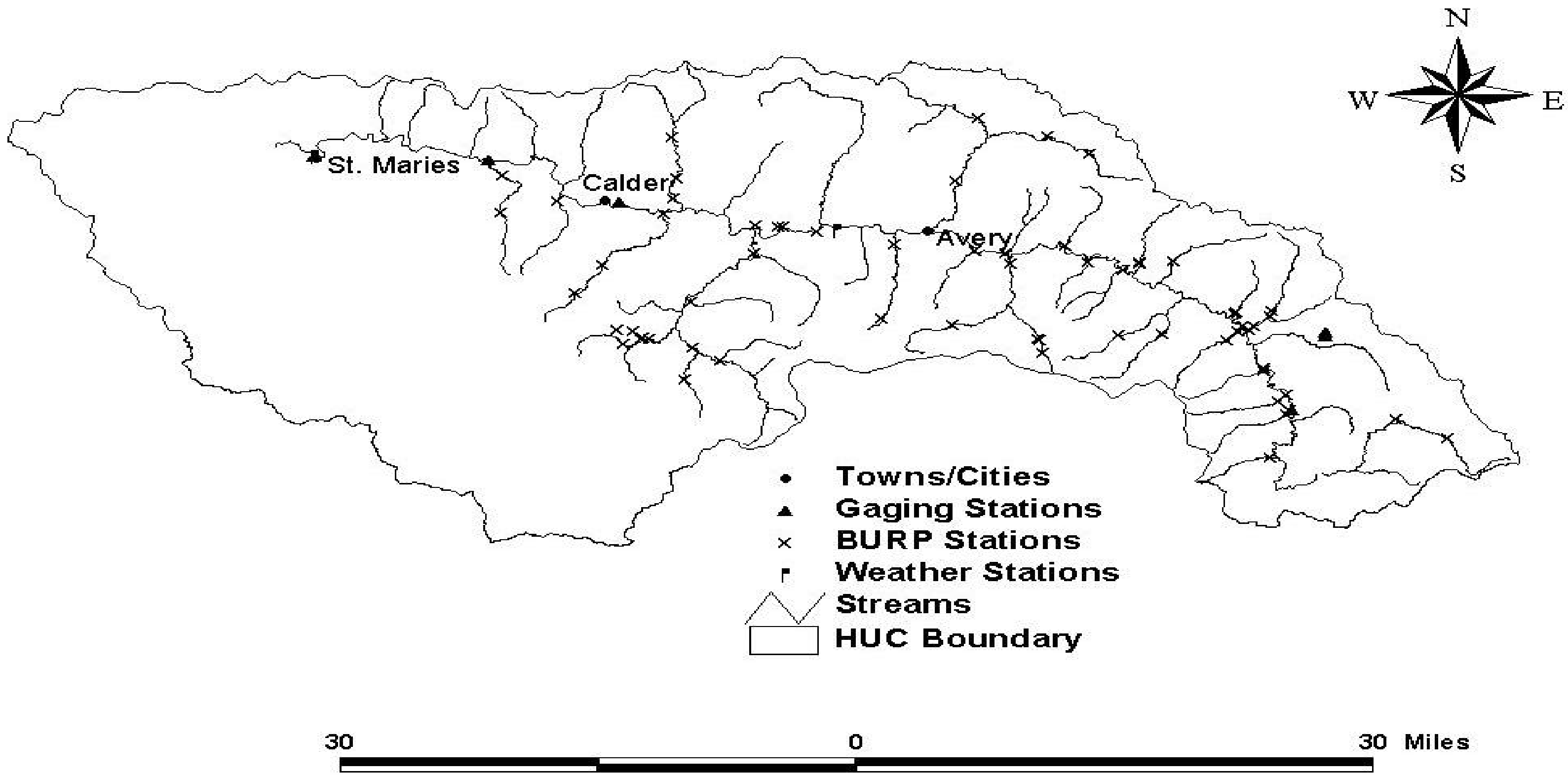

Figure 2. St. Joe River Subbasin Showing Locations of Gaging, BURP, and Weather Stations

-- Vegetation

The mountain slopes are mantled with mixed coniferous forest of true fir (*Abies spp.*), Douglas fir (*Pseudotsuga menziesii*), larch (*Larix spp.*), and pine (*Pinus spp.*). Forest harvest has occurred at significant levels in all watersheds of the basin. Rivers and streams are flanked by riparian stands dominated by cottonwood (*Populus spp.*) at lower elevations and alder (*Alnus spp.*) in the higher valleys. The lower St. Joe River valley floor is comprised of lacustrine deposits. These lands have been converted to pasture to varying degrees. Lateral wetlands are found in the lower river floodplain. Aquatic vegetation, such as rush (*Juncus spp.*), sedge (*Carex spp.*), and cattail (*Typha latifolia*), are common in these wetlands. Some floodplain fields have been converted to the cultivation of wild rice (*Zizania spp.*).

-- Fisheries and Aquatic Fauna

The native salmonids of the subbasin's streams are cutthroat trout (*Oncorhynchus clarki*), bull trout (*Salvelinus confluentus*), and mountain whitefish (*Prosopium williamsoni*). The upper St. Joe River above Prospector Creek has the last self-sustaining bull trout population in the Coeur d'Alene Basin. Sculpin (C*ottus spp.*) and shiners (*Notropis spp.*) are non-salmonid natives. The tailed frog (*Ascaphus truei*), Idaho giant salamander (*Dicamptodon aterrimus*), and painted turtle (*Chrysemys picta*) complete the vertebrate species. Fish populations in the river and some of its tributaries have been altered by the introduction of rainbow trout (*Oncorhynchus mykiss*) and brook trout (*Salvelinus fontinalis*), as well as Chinook salmon (*Oncorhynchus tshawytscha*) and Kokanee salmon (*Oncorhynchus nerka*). Pike (*Esox lucius*) and small mouth bass (*Micropterus dolomieu*) are present in the lower St. Joe River. Introduced species have been able to establish in some habitats at lower elevations, while higher elevation water bodies tend to retain native trout. Fish composition and abundance appear stable in the headwaters.

Idaho considers cutthroat trout a sensitive species. Bull trout are federally listed as a threatened species. Bull trout are present in a self-sustaining population in the subbasin. A bull trout recovery area was delineated in 1996. It extends from the headwaters of the St. Joe River to the mouth of Mica Creek (Batt 1996). No other sensitive, threatened, or endangered aquatic species are known to exist in the subbasin.

The salmonids of the St. Joe subbasin spawn in both the spring and the fall. Cutthroat trout spawn after peak snowmelt runoff in the spring. While actual spawning dates vary from year to year, cutthroat spawning generally occurs from March through late July. Bull trout and mountain whitefish are spawn in the fall. As designated in the State of Idaho Bull Trout Conservation Plan (Batt 1996), the fall spawning period is September 1 through October 31.

Subwatershed Characteristics

The subwatershed characteristics are summarized in Table 1.

Table 1. Watershed characteristics of the fifth order watersheds of the St. Joe River subbasin.

Fifth Order Watershed	Area (acres)	Land Form	Dominant Aspect	Relief Ratio[1]	Mean Elevation (meters)	Dominant Slope	Hydrologic Regimes	Estimated Water Yield (acre-feet/year)	Mass Wasting Potential
Bond-Falls	69,844	Mountainous	West	0.014	1,010	40%	Spring snowmelt; Rain-on-snow	1,806,511	Low
Hugus-Trout	41,716	Mountainous	West	0.016	1,023	40%	Spring snowmelt; Rain-on-snow	1,078,965	Low
Big	36,251	Mountainous	South	0.013	1,210	40%	Spring snowmelt; Rain-on-snow	937,635	Low
Black Prince	29,600	Mountainous	South	0.003	1.057	40%	Spring snowmelt; Rain-on-snow	765,586	Low
Mica	26,108	Mountainous	East	0.013	1,182	20-30%	Spring snowmelt; Rain-on-snow	675,266	Low
Slate	42,824	Mountainous	West	0.011	1,335	40%	Spring snowmelt; Rain-on-snow	1,107,626	Low
Upper Marble	38,580	Mountainous	East	0.007	1,520	20-30%	Spring snowmelt	997,864	Low
Marble	53,300	Mountainous	East	0.008	1,279	20-30%	Spring snowmelt; Rain-on-snow	1,378,592	Low
Fishhook	58,830	Mountainous	East	0.009	1,248	40%	Spring snowmelt; Rain-on-snow	1,521,616	Low
North Fork St. Joe	73,071	Mountainous	South	0.015	1,384	40%	Spring snowmelt; Rain-on-snow	1,889,955	Low
Sisters	43,621	Mountainous	West	0.010	1,401	40%	Spring snowmelt; Rain-on-snow	1,128,251	Low/ Moderate
Prospector-Eagle	36,850	Mountainous	West	0.009	1,355	40%	Spring snowmelt; Rain-on-snow	953,109	Low
Bluff-Gold	81,811	Mountainous	South	0.014	1,470	40%	Spring snowmelt; Rain-on-snow	2,116,026	Low
Beaver-Simmons	80,830	Mountainous	South	0.009	1,498	40%	Spring snowmelt; Rain-on-snow	2,090,50	Low
Upper St. Joe	49,331	Mountainous	West	0.011	1,684	40%	Spring snowmelt; Rain-on-snow	1,275,925	Low

[1] $R_h = H/L$, where H is the difference between the highest and lowest point in the basin and L is the horizontal distance along the longest dimension of the basin parallel to the main stream line.

Stream Characteristics

Tributaries to the St. Joe River generally have V-shaped valleys as a result of the deeply dissected nature of the topography in their upper reaches. Near the valley bottoms, the tributaries are even higher in gradient as they plunge to meet the St. Joe River. The tributary valleys accommodate primarily Rosgen A and high gradient B channels in the upper watersheds and often Rosgen A channels near their mouths. The tributaries are generally bound by boulder-bedrock substrate. The Belt Supergroup bedrock underlies much of the subbasin. Soils are fairly rich in coarse fragments (65%) and rather poor in fine materials (35%) in most watersheds assessed. However, some watersheds with soils evenly divided between coarse and fine materials were found and a few had a preponderance of fine materials. As a result of the soil composition and the steep tributary gradients, boulders and cobble comprise the majority of the stream sediment particles. Width to depth ratios are low in these streams. Floodplains are narrow in uppermost tributary channels. Riparian communities, correspondingly, are narrow in the narrow valleys.

The upper reaches of the St. Joe River valley have U-shaped valleys resulting from glacial activity. The river valley narrows in the vicinity of the Marble Creek confluence. Width to depth ratios are generally low above this point. As the stream passes from Marble Creek to Pollard Creek the valley widens and deposits of sediment bars become apparent in the river. A lower gradient allows the deposition of coarse sediments through this reach. The river valley widens progressively as the river moves west towards the city of St. Maries and its confluence with the St. Maries River. The hydraulic influence of the Post Falls Dam on the Spokane River outlet of Coeur d'Alene Lake occurs at St. Joe City. The channel is a very low gradient Rosgen F channel that meanders through a broad floodplain with some lateral wetlands. The channel is 15 feet deep in most locations and 30 to 40 feet deep in meander bends. Silts dominate the sediment of the river throughout its lower course. Along most of the river, floodplains are broad with broad corresponding riparian communities. The river channel and floodplain morphology remains unchanged below the city of St. Maries. The lateral lakes of the river (Benewah, Round, Chatcolet, and Hidden) are commingled much of the year with Coeur d'Alene Lake as a result of the Post Falls impoundment.

1.3 Cultural Characteristics

The St. Joe River subbasin has timber and some range land resources. These natural resources have been developed since the early 1900s.

Additionally, the Coeur d'Alene Tribe's aboriginal territory takes in all of the St. Joe and St. Maries watersheds. Today, the Coeur d'Alene Tribal people return to this land just like their ancestors did to hunt, gather, and practice cultural traditions. The Coeur d'Alene's used these waters for subsistence living in the past and will continue to do so in the future.

Land Use

Land use of the St. Joe River subbasin is shown in Figure 3. Land use is divided between the uplands and the valley bottoms of the lower river. The uplands are forested, while the valley bottoms of the lower river are used for grazing and a small amount of rice growing.
The forested land is in multiple ownership with varying management directions. National Forest land is managed for multiple resource outputs (timber, water, and recreation). State forestland is managed for timber to support the state School Trust Fund. Commercial forestland is managed primarily for timber production. A considerable amount of forestland is in private ownership. These lands are managed for several resource outputs.

Grazing lands are located in the bottomlands along the St. Joe River below Calder.

Land Ownership, Cultural Features, and Population

Management of the 762,766-acre (1,192 square mile) watershed, is divided among United States Forest Service (USFS) managed land (521,398 acres; 68.2%); private owners, which are primarily timber companies of Idaho, (192,977 acres; 25.3%); Bureau of Land Management (29,485 acres; 3.9%); state (18,074 acres; 2.4%); open water (1,095 acres; 0.1%); and Bureau of Indian Affairs (478 acres; <0.1%) (IDL GIS Database). Private property, exclusive of those owned by timber companies, is primarily bottomlands along the lower St. Joe River near St. Joe City and the town of Calder, plus a few scattered parcels that are typically patented mining claims. The majority of the upper watershed is part of the St. Joe National Forest. The Mica, Marble, and Fishhook Creek watersheds supported large logging operations during the early part of the twentieth century.

The St. Joe River subbasin is in Benewah and Shoshone Counties. The population of Benewah County is approximately 9,200. Roughly half of its residents live in the subbasin. St. Maries is the largest town in the subbasin and is the Benewah county seat. It has a population of 2,500. The Shoshone County population is 13,771. Relatively few people reside in the Shoshone County part of the subbasin. The population of the subbasin is stable. Three small towns, St. Joe City, Calder, and Avery, are located in the St. Joe River subbasin. None of these has a population in excess of 50. Resident and seasonal populations are sparse in the remainder of the watershed. The subdivision of pastures along the lower St. Joe River into summer recreational vehicle parks has increased summer occupancy in these areas in recent years.

Seasonal and permanent homes, as well as recreational vehicle camps, are located in bottomlands along the lower river. Sixteen recreation areas (primarily picnic areas and campgrounds) and five national recreational trails are located in the watershed. The Milwaukee-Chicago-St. Paul railroad grade near Loop Creek has been converted into a bicycle trail. The St. Joe River above the Spruce Tree campground is designated as a wild river, while the entire river is designated a scenic river.

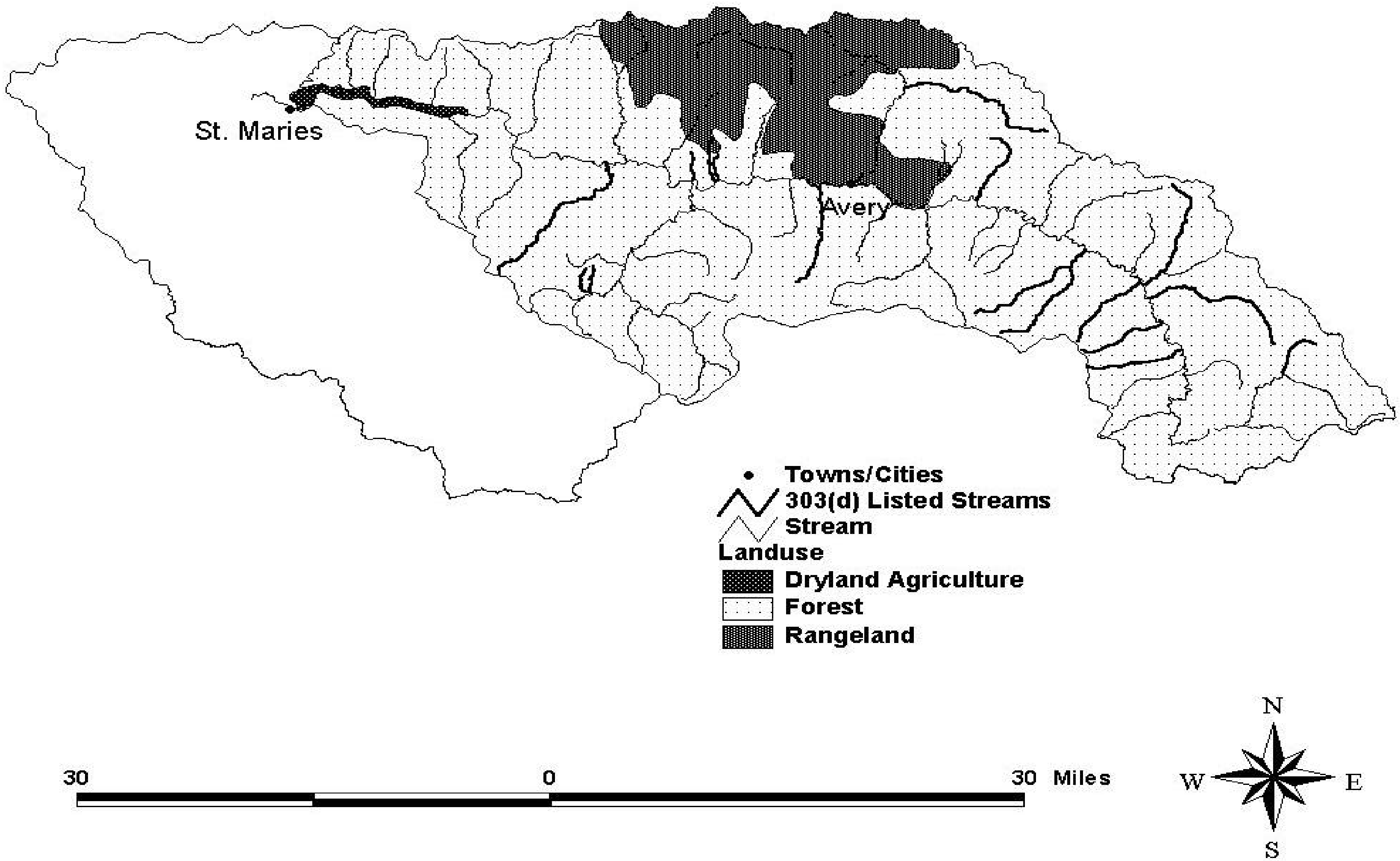

Figure 3. Land Use in the St. Joe River Subbasin

History and Economics

The St. Joe River subbasin was settled and developed during the early decades of the twentieth century (Russell 1979). Grazing is now restricted to the lower river valley. Minor grazing impacts occurred in the watershed in the past. Mineral extraction occurs at some sites throughout the watershed. The upper portion of the St. Joe River subbasin was heavily burned in the fire of 1910. Some unburned watersheds within the subbasin have sustained appreciable timber harvest during the twentieth century. Mica, Marble, and Fishhook Creeks, in particular, were logged heavily in the past. Logging companies initially used the waterways as the log transport system. A system of log flumes, splash dams, and log drives was used to move logs to mills near the city of St. Maries. The splash dams and log drives caused severe structural disruptions to the streams. Railroad logging was also practiced in some watersheds. Later, roads were built in the stream bottoms, fundamentally altering stream gradient and stability.

From the 1940s to the 1970s, timber harvest depended on an extensive road network. Logging with early jammer systems necessitated roads at approximately 100-yard intervals on slopes. The result is a network of roads that intercepts the subbasin's natural drainage system at numerous locations (Figure 4). The mid-century harvests also relied heavily on clear-cut prescriptions. Despite this, impacts from old road systems and logging are not widespread.

The Benewah Soil and Water Conservation District has been active in addressing soil and water conservation issues in the subbasin for many years. The agency has also been active in stream bank stabilization efforts. They have recently formed the core of the St. Joe River subbasin Watershed Advisory Group (WAG) along with representatives of the Coeur d'Alene Tribe, Idaho Department of Fish and Game, Idaho Department of Lands (IDL), Potlatch Company, Emerald Creek Garnet Company, and the USFS. The St. Joe WAG is providing input regarding the St. Joe River and St. Maries River subbasin assessments and will advise DEQ on required TMDLs and implementation plans.

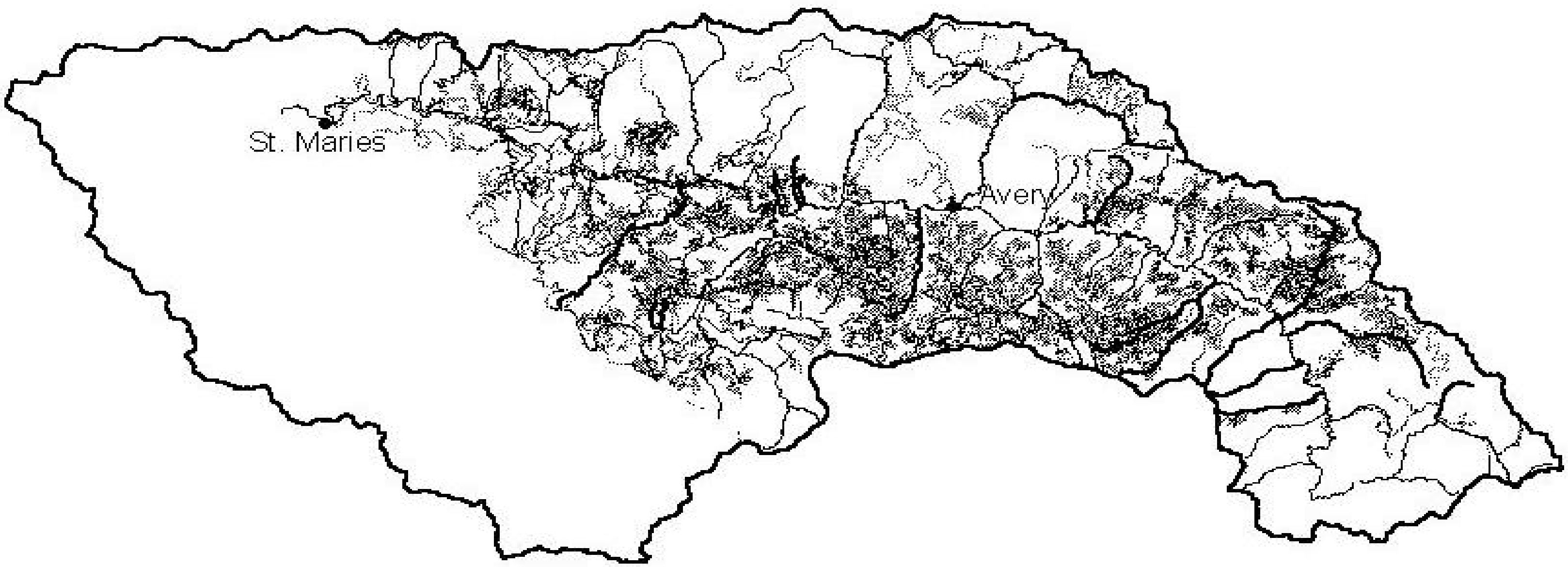

Figure 4. Roads and Road Crossings of Streams in the St. Joe River Subbasin

2. Subbasin Assessment – Water Quality Concerns and Status

The St. Joe River and most of the stream segments in its watershed are not listed as water quality limited under Section 303(d) of the CWA. Seventeen water bodies of the subbasin are listed under Section 303(d) of the CWA.

2.1 Water Quality Limited Segments Occurring in the Subbasin

The St. Joe River subbasin has 17 water quality limited 303(d) listed stream segments according to the 1998 303(d) list. These segments are listed in Table 2, including their segment ID numbers, designated boundaries, and reasons for listing. Listed segments are mapped in Figure 1.

Sediment and temperature are the two most prevalent pollutants listed. Sediment is listed for eight segments. Temperature is listed for 12 segments. Bacteria and dissolved oxygen are listed for five and three segments, respectively. Nutrients responsible for aquatic plant growth are listed as the pollutant for one segment. Habitat alteration is also listed for one segment; however, habitat alteration is not an impact that can be addressed by a TMDL.

2.2 Applicable Water Quality Standards

The water quality standards designate beneficial uses and set water quality goals for the waters of the state. The designated uses for the St. Joe River subbasin and the applicable water quality standards appear below.

Beneficial Uses

Idaho water quality standards require that surface waters of the state be protected for beneficial uses, wherever attainable (IDAPA 58.01.02.050.02). These beneficial uses are interpreted as existing uses, designated uses, and "presumed" uses as briefly described in the following paragraphs. The *Water Body Assessment Guidance*, second edition (Grafe et al. 2002) gives a more detailed description of beneficial use identification for use assessment purposes.

-- Existing Uses

Existing uses under the CWA are "those uses actually attained in the water body on or after November 28, 1975, whether or not they are included in the water quality standards." The existing in stream water uses and the level of water quality necessary to protect the uses shall be maintained and protected (IDAPA 58.01.02.003.35, .050.02, and 051.01 and .053). Existing uses include uses actually occurring, whether or not the level of quality to fully support the uses exists. Practical application of this concept would be when a waterbody could support salmonid spawning, but salmonid spawning is not yet occurring.

Table 2. 303(d) listed segments in the St. Joe River subbasin.

Water Body Name	Segment ID Number	Assess-ment Unit	1998 303(d) Boundaries	Pollutants	Listing Basis[1]
Bear Creek	7606	PN033_02	Headwaters to Toles Creek	Bacteria, sediment, temperature	Appendix A, 305(b)
Beaver Creek	5619	PN025_02 PN048_02	Headwaters to St. Joe River	Temperature	EPA addition
Bird Creek	3614	PN057_02	Headwaters to St. Joe River	Sediment	Appendix A, 305(b)
Blackjack Creek	7577	PN027_02	Headwaters to St. Joe River	Dissolved oxygen, bacteria, sediment, temperature	Appendix A, 305(b)
Bluff Creek	5022	PN045_02	Headwaters to St. Joe River	Temperature	EPA addition
East Fork Bluff Creek	5022	PN045_02	Headwaters to St. Joe River	Sediment	Appendix A, 305(b)
Fishhook Creek	3608	PN039_04	Lick Creek to St. Joe River	Sediment, temperature	Appendix A, 305(b); EPA addition
Fly Creek	2016	PN041_02	Headwaters to St. Joe River	Temperature	EPA addition
Gold Creek	3622	PN053_02	East Fork Gold Creek to St. Joe River	Habitat alteration, nutrients, sediment, temperature	Appendix A 305(b)
Harvey Creek	7576	PN027_02	Headwaters to St. Joe River	Dissolved Oxygen, bacteria, sediment, temperature	Appendix A, 305(b)
Heller Creek	2017	PN041_02	Headwaters to St. Joe River	Temperature	EPA addition
Little Bear Creek	7607	PN033_02	Headwaters to Bear Creek	Bacteria, sediment, temperature	Appendix A, 305(b)
Loop Creek	5620	PN060_02	Headwaters to North Fork St. Joe River	Sediment, unknown, temperature	Appendix A, 305(b); BURP Data; EPA addition
Mica Creek	3601	PN030_03	Headwaters to St. Joe River	Sediment	Appendix A, 305(b)
Mosquito Creek	3621	PN046_02	Headwaters to St. Joe River	Temperature	EPA addition
Simmons Creek	2022	PN052_02 /03	Headwaters to St. Joe River	Temperature	EPA addition
Tank Creek	7575	PN027_02	Headwaters to St. Joe River	Dissolved Oxygen, bacteria, sediment, temperature	Appendix A, 305(b)

[1] "EPA addition" refers to EPA additions to the 1ist created in 1998 of water bodies in Idaho that did not fully support at least one beneficial use.

-- Designated Uses

Designated uses under the CWA are “those uses specified in water quality standards for each water body or segment, whether or not they are being attained.” Designated uses are simply uses officially recognized by the state. In Idaho these include things like aquatic life support, recreation in and on the water, domestic water supply, and agricultural use. Water quality must be sufficiently maintained to meet the most sensitive use. Designated uses may be added or removed using specific procedures provided for in state law, but the effect must not be to preclude protection of an existing higher quality use such as cold water aquatic life or salmonid spawning. Designated uses are specifically listed for water bodies in Idaho in the state water quality standards (see IDAPA 58.01.02.003.22 and .100, and IDAPA 58.01.02.109-160 in addition to citations for existing uses).

The St. Joe River (Unit P-41, Source to North Fork St. Joe River; and Unit P-27, North Fork St. Joe River to St. Maries River) has designated beneficial uses of cold water, salmonid spawning, primary contact recreation, domestic water supply, and special resource water (Table 3). Beneficial uses have not been designated for the other listed tributaries of the St. Joe River.

-- Presumed Uses

In Idaho, most water bodies listed in the tables of designated uses in the water quality standards do not yet have specific use designations. These undesignated uses are to be designated. In the interim, and absent information on existing uses, DEQ presumes that most waters in the state will support cold water aquatic life and either primary or secondary contact recreation (IDAPA 58.01.02.101.01). To protect these so-called “presumed uses,” DEQ will apply the numeric criteria cold water and primary or secondary contact recreation criteria to undesignated waters. If in addition to these presumed uses, an additional existing use, (e.g., salmonid spawning) exists, because of the requirement to protect levels of water quality for existing uses, then the additional numeric criteria for salmonid spawning would additionally apply (e.g., intergravel dissolved oxygen, temperature). However, if, for example, cold water is not found to be an existing use, an use designation to that effect is needed before some other aquatic life criteria (such as seasonal cold) can be applied in lieu of cold water criteria. (IDAPA 58.01.02.101.01).

Table 3. St. Joe River subbasin designated beneficial uses.

Unit	Water Body	Designated Uses[1]			303(d) Listed
		Aquatic Life	Recreation	Other	
P-27	St. Joe River	CW, SS	PCR	DWS, SRW	no
P-41	St. Joe River	CW, SS	PCR	DWS, SRW	no

[1]CW – Cold Water, SS – Salmonid Spawning, PCR – Primary Contact Recreation, DWS – Domestic Water Supply, SRW – Special Resource Water

Table 4. St. Joe River subbasin beneficial uses of impaired streams without standard designated uses.

Unit	Water Body	Designated Uses[1]		303(d) Listed
		Aquatic Life	Recreation	
P-33	Bear Creek	CW, SS	SCR	yes
P-48	Beaver Creek	CW, SS	SCR	yes
P-57	Bird Creek	CW, SS	SCR	yes
P-27	Blackjack Creek	CW, SS	SCR	yes
P-45	Bluff	CW, SS	SCR	yes
P-45	East Fork Bluff Creek	CW, SS	SCR	yes
P-39	Fishhook Creek	CW, SS	SCR	yes
P-47	Fly Creek	CW, SS	SCR	yes
P-53	Gold Creek	CW, SS	SCR	yes
P-27	Harvey Creek	CW, SS	PCR	yes
P-41	Heller Creek	CW, SS	SCR	yes
P-33	Little Bear Creek	CW, SS	PCR	yes
P-60	Loop Creek	CW, SS	SCR	yes
P-30	Mica Creek	CW, SS	SCR	yes
P-52	Simmons	CW, SS	SCR	yes
P-46	Mosquito	CW, SS	SCR	yes
P-27	Tank Creek	CW, SS	SCR	yes

[1]CW – Cold Water Aquatic Life, SS – Salmonid Spawning, PCR – Primary Contact Recreation, SCR – Secondary Contact Recreation

Water Quality Standards

Water quality criteria supportive of the beneficial uses are stated in the Idaho Water Quality Standards and Wastewater Treatment Requirements (DEQ 2000). The standards supporting the beneficial uses are outlined in Table 5. In addition to these standards, cold water and salmonid spawning are supported by two narrative standards. The narrative sediment standard states:

Sediment shall not exceed quantities specified in section 250 and 252 or, in the absence of specific sediment criteria, quantities, which impair designated beneficial uses. Determinations of impairment shall be based on water quality monitoring and surveillance and the information utilized as described in Subsection 350 (IDAPA 58.01.02.200.08).

The excess nutrients standard states:

Surface waters of the state shall be free from excess nutrients that can cause visible slime growths or other aquatic growths impairing designated beneficial uses (IDAPA 58.01.02.200.06).

Table 5. Water quality standards supportive of beneficial uses (IDAPA 58.01.02.250) [1].

Designated Use	Primary Contact Recreation	Secondary Contact Recreation	Cold Water Aquatic Use	Salmonid Spawning
Coliforms and pH	126 EC/100 mL geometric mean over 30 days	126 EC/100 mL geometric mean over 30 days	pH between 6.5 and 9.5	pH between 6.5 and 9.5
Dissolved gas			dissolved gas not exceeding 110%	dissolved gas not exceeding 110%
Chlorine			total chlorine residual less than 19 ?g/L/hr or an average 11 ?g/L/4-day period	total chlorine residual less than 19 ?g/L/hr or an average 11 ?g/L/4-day period
Toxic substances			less than toxic substances set forth in 40 CFR 131.36(b)(1) Columns B1, B2, D2	less than toxic substances set forth in 40 CFR 131.36(b)(1) Columns B1, B2, D2
Dissolved oxygen			exceeding 6 mg/L D.O.	exceeding 5 mg/L intergraval D. O.; exceeding 6 mg/L surface
Temperature			less than 22^{o}C (72^{o}F) instantaneous; 19^{o}C (66^{o}F) daily average or natural background, if greater	less than 13^{o}C (55^{o}F) instantaneous; 9^{o}C (48^{o}F) daily average or natural background, if greater
Ammonia			low ammonia (formula/tables for exact concentration)	low ammonia (formula/tables for exact concentration)
Turbidity			less than 50 NTU instantaneous; 25 NTU over 10 days greater than background[2]	

[1] pH – negative logarithm of the hydrogen ion concentration; EC - *Escherichia coli;* ?g/L – micrograms per liter; D.O. – dissolved oxygen; mg/L – milligrams per liter; ^{o}C – degrees centigrade; ^{o}F – degrees Fahrenheit; NTU – nephlometric turbidity units.

[2] The turbidity standard is a standard applied to the mixing zones of point discharges in the water quality standards (IDAPA 58.01.02.250.01.d). However, the standard is technically based on the ability of salmonids to sight feed, thereby making it applicable through the narrative sediment standard (IDAPA58.01.02.200.08) to impacts on salmonids (cold water aquatic use) wherever these may occur.

2.3 Summary and Analysis of Existing Water Quality Data

Existing data for the St. Joe River subbasin are restricted to relatively few sources. The USGS has operated a discharge gage on the St. Joe River near Calder (12414500) since July 1920 and a discharge gage at the Red Ives Ranger Station (12413875) since 1997. Water quality data have been collected at the Calder station intermittently since the late 1980s. These data include temperature, pH, dissolved oxygen, and aquatic plant growth nutrient measurements. No additional data other than discharge are collected at the Red Ives station. The USGS operated a gage at the city of St. Maries during water year 1992. Physical and water chemistry data were collected. DEQ staff collected aquatic plant growth nutrients, dissolved oxygen, and bacteria data at various sites on the impaired segments of the St. Joe River subbasin during water year 2000. Beneficial Use Reconnaissance Program (BURP) data were collected on all water quality limited streams. These data include temperature, habitat, macroinvertebrate, and fisheries data. Sediment source data were collected during the summers of 2000 and 2001 through the Idaho Department of Lands Cumulative Watershed Effects (CWE) program.

Discharge Characteristics

The USGS has continuously operated the Calder Gaging Station (12414500) since July 1920. The average annual discharge hydrograph of the station indicates the spring snowmelt event dominates the pattern of stream discharge (Figure 5)(USGS 1996-2000). The mean high flow discharge for 1996-2000 occurred in April at 1,213 cubic feet per second (cfs) and the mean low flow discharge in September at 64 cfs. Bank full discharge is in the range of 1,200 cfs. Rain-on-snow conditions can result in large discharge (flood) events as occurred during winter 1995-1996 (Figure 6)(USGS 1997). The St. Joe watershed has less than half its slopes in the 3,330 to 4,500 feet elevation range. Peak discharges during the third largest flood on record (February 1996) were estimated at 34,000 cfs.

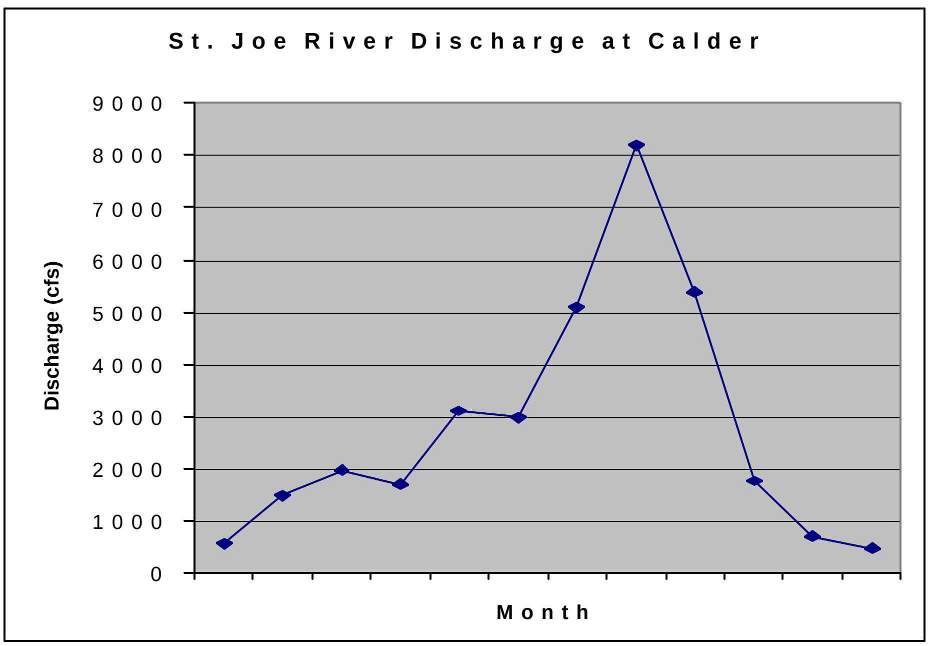

Figure 5. Annual Discharge Hydrograph of the St. Joe River at Calder, Based on Five-Year (1996-2000) Monthly Averages

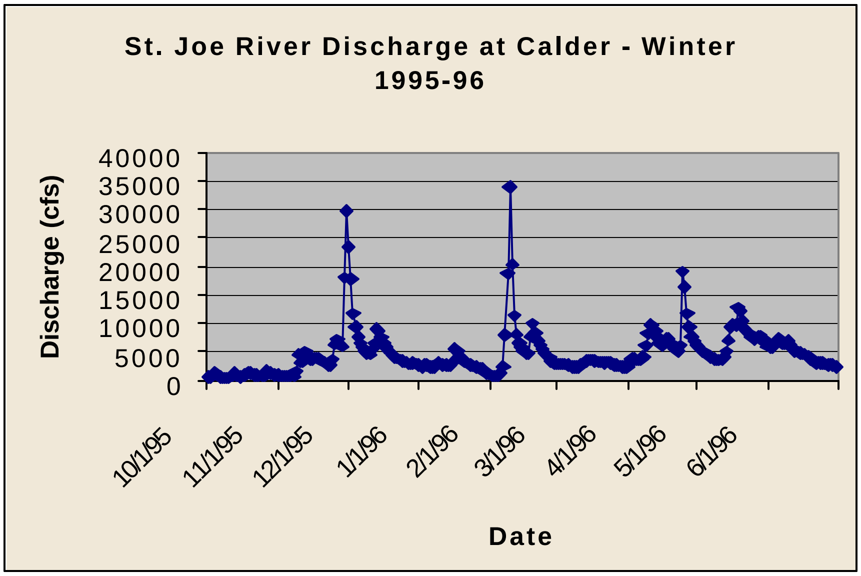

Figure 6. Discharge Hydrograph of the St. Joe River at Calder During Winter 1995-1996

Water Quality Data

Water quality data have been collected at the Calder and St. Maries gages by the USGS under contract to DEQ and EPA. DEQ collected aquatic plant growth nutrient and dissolved oxygen data at four locations in the subbasin. DEQ has collected temperature data with data loggers from several streams in the St. Joe River subbasin.

-- General data from the Calder and St. Maries gage stations

Selected water quality data collected by the USGS at the Calder gage between 1994 and 2000 are summarized in Table 6. The entire data set is provided in Appendix B. The data in Table 6 indicate no exceedences of water quality standards. The Calder gage data are limited, but indicate generally high water quality.

Averages of selected water quality data collected at the St. Maries gage operated by the USGS during water years 1991 and 1992 are provided in Table 7. These data indicate that the St. Joe River is low in plant growth nutrients. The entire data set is available in Appendix B. Data from the Calder and St. Maries stations indicate the water of the St. Joe River is of high quality

Table 6. Water quality of the St. Joe River at the Calder gaging station.

Sample Date	Water Temp (?C)	Inst. Discharge (cubic feet per second)	Specific Conductance (? s/cm) [1]	pH (standard Units)	Nitrogen, Ammonia Dissolved (mg/L as N)	Nitrogen, Ammonia + Organic Total (mg/L as N)	Nitrogen, Nitrate + Nitrite Dissolved (mg/L as N)	Phosphorus Total (mg/L as P)	Phosphorus Ortho Dissolved (mg/L as P)
09/04/96	14.7	436	65.0	7.72	0.015	0.20	0.050	0.01	0.010
04/27/98	6.2	5,010	42.0	7.05	0.035	0.10	0.050	0.01	0.010
05/11/98	7.3	6,360	34.0	7.25	0.068	0.10	0.050	0.01	0.010
06/15/98	10.4	2,980	46.0	7.37	0.053	0.10	0.057	0.019	0.014
07/08/98	17.9	1,380	57.0	6.72	0.054	0.10	0.050	0.01	0.020
08/10/98	19.7	607	66.0	8.02	0.046	0.10	0.050	0.01	0.010
09/14/98	16.0	413	69.0	7.76	0.028	0.10	0.050	0.01	0.010
10/21/98	7.00	357	61.0	7.51	0.002	0.10	0.0050	0.002	0.001
11/19/98	5.00	531	53.0	7.9	0.003	0.10	0.018	0.004	0.001
12/09/98	2.00	688	56.0	7.35	0.002	0.10	0.005	0.003	0.002
01/26/99	0.00	1,100	51.0	7.65	0.003		0.010	0.0048	0.003
02/09/99	1.00	952	52.0	7.36	0.003	0.10	0.007	0.0054	0.003
03/10/99	2.00	1,140	54.0	6.86	0.002	0.10	0.005	0.004	0.002
04/14/99	3.10	2,470	53.0	7.06	0.003	0.10	0.005	0.007	0.003
05/10/99	3.90	4,320	45.0	7.57	0.004	0.10	0.005	0.004	0.002
06/08/99	6.00	6,990	34.0	7.44	0.004	0.11	0.018	0.009	0.004
07/14/99	11.6	2,790	38.0	7.28	0.002		0.005	0.005	0.002
08/10/99	18.7	929	54.0	7.68	0.011		0.005	0.004	0.002
09/09/99	11.1	546	61.0	7.45	0.013		0.005	0.004	0.002
Mean	8.6	2,105	52.0	7.42	0.018	0.10	0.024	0.007	0.006

[1] microsiemens per centimeter

Table 7. Select water quality data from the St. Maries Gage (12415075).

Water Year	Specific Conductance (Microsiemens/cm at 25 ?C)	Nitrogen Ammonia Total (mg/L as N)	Nitrogen Nitrite Total (mg/L as N)	Nitrogen Ammonia plus Organic Total (mg/L as N)	Nitrogen Nitrite plus Nitrate Total (mg/L as N)	Phosphorus Total (mg/L as P)	Phosphorus O-Phosphate Total (mg/L as P)
1991 Mean	46	0.021	0.005	0.339	0.061	0.012	0.003
1992 Mean	51	0.016	0.006	0.204	0.014	0.013	0.006

-- Dissolved Oxygen

Blackjack, Harvey, and Tank Creeks are listed for dissolved oxygen limitation. The dissolved oxygen concentrations of the three streams were measured in late August 2000 after a prolonged period of warm weather without precipitation. If oxygen deficiency occurs, it would be expected under these conditions. The dissolved oxygen concentrations and percent saturation measured are provided in Table 8. The values are higher than the minimum standard of 6 milligrams per liter (mg/L) dissolved oxygen (Table 5) or 90% saturation, which is expected in steams with high gradients. Based on these data, Blackjack, Harvey, and Tank Creeks are not limited by dissolved oxygen concentration.

Table 8. Dissolved oxygen and percent saturation measured in Blackjack, Harvey, and Tank Creeks.

Stream	Dissolved Oxygen (mg/L)	Percent Saturation
Blackjack Creek	10.0	98.5
Harvey Creek	10.3	100.2
Tank Creek	9.9	97.7

-- Nutrients

Gold Creek is listed for nutrients. No obvious sources of nutrients were observed in the Gold Creek watershed. Water samples collected on three dates during summer 2000 from two locations on Gold Creek were analyzed for total phosphorous, nitrite-nitrate, and total Kjeldahl nitrogen. The analytical results are provided in Tables 9 a and b. Nutrient concentrations were slightly higher on the upstream segment than the lower segment, which is listed on the1998 303(d) list. Total Kjeldahl nitrogen data indicated that nearly all nitrogen was in the nitrite and nitrate forms. Concentrations measured in Gold Creek are below the nitrite-nitrate and total phosphorous guidelines. The results demonstrate that Gold Creek is not water quality limited by nutrients and is visibly free from slime and other aquatic growths.

Table 9. Plant growth nutrient concentrations at two locations on Gold Creek.

a) Total phosphorous (mg/L)

Location	6/26/00	7/26/00	8/24/00	Mean
Near mouth	0.008	0.011	0.009	0.009
Above East Fork	0.012	0.012	0.010	0.011

b) Total nitrate-nitrite (mg/L)

Location	6/26/00[1]	7/26/00	8/24/00	Mean
Near mouth	<0.100	0.164	0.150	0.105
Above East Fork	0.035	0.165	0.156	0.125

[1]Less than .100 treated as .005 mg/L in means.

-- Temperature

Bear, Blackjack, Gold, Harvey, Little Bear, and Tank Creeks are listed as limited by temperature standard exceedences. Except for Tank Creek, summer/fall temperatures were continuously monitored on these and several other tributaries to the St. Joe River. Temperature data are not available for Tank Creek because it was dry in the summers of 1997 and 1998, when the data were collected. Blackjack and Harvey Creeks are located very near to Tank Creek. These streams can be used as temperature surrogates for Tank Creek. The temperature profile, as well as the analysis of the data for exceedences of federal and state bull trout standards and cutthroat and bull trout spawning standards, is provided in Appendix B.

The bull trout temperature standard exceedence was assessed as the percentage of seven-day average maximum temperature exceedences during the period from May 1 to October 31. This value is plotted with the average stream temperature on the graph in Appendix B. The individual bull trout and spawning standards are plotted for the periods these apply. Where the temperature recording trace did not start and/or end within the standard, the slope of the temperature trend line was measured and applied to estimate the number of days of temperature exceedence prior to or following the record. The cutthroat trout spawning standard was assessed from seven days after the peak of the spring discharge hydrograph through July 31. Discharge peaks were determined using the Calder gage for the down stream tributaries to the river and the Red Ives gage for the up stream tributaries. These gages were cross-referenced against the peaks at the Bird, Skookum, and Marble Creek gages operated by the USFS (Patten 2000). The cutthroat standard was compared to the average water temperature. The bull trout spawning standard was assessed from September 1 to October 31. After October 31, it is unlikely that water temperatures in any streams would exceed the 9 ?C standard. The standards were assessed against the average water temperature. In those cases that temperatures exceeded the spawning standards at the start and/or end of the temperature record, the extrapolation method described above was applied to estimate the number of days of exceedence beyond the period of record.

The percentage standard exceedence in each stream is provided in Table 10. The federal bull trout temperature standard was exceeded in the streams listed for temperature and in all other streams assessed in the subbasin. The state bull trout temperature standard was exceeded in all streams assessed except Little Bear Creek. None of the streams listed for temperature in the subbasin are designated bull trout streams in the proposed federal rule. However, Beaver, California, Fishhook, Gold, Heller, Marble, Medicine, Sherlock, and Yankee Bar Creeks, and the main stem and North Fork St. Joe River are all listed in the federal rule. None of these streams meets the federal or state temperature standards for bull trout, even though California, Heller, and Yankee Bar have no roads or development and very little placer mining. The entire Upper St. Joe River has very limited development. The cutthroat trout and bull trout spawning standards are exceeded in all streams listed for temperature as well as all other streams, except Medicine Creek. Standard exceedences are for substantial periods. The BURP results employed to develop the 1998 303(d) list indicated that many of these streams fully support their cold water aquatic life and salmonid spawning uses. This result is supported by analyses conducted according to the *Water Body Assessment Guidance, Second Edition* (Grafe *et al*. 2002). The nearly uniform exceedence of the state and federal temperature standards during July, August, and early September, even in undeveloped watersheds, suggests the standards may not be realistic.

Based on the current temperature monitoring results and temperature standards, listed streams Beaver, Bluff, Fishhook, Heller, and Loop Creeks are limited by temperature. Given the results from unlisted streams, it is reasonable to assume that Fly, Mosquito, and Simmons are limited by temperature as well.

Table 10. Percentage exceedence of federal and state bull trout and spawning standards during the period for which the standard applies.

Stream	Federal Bull Trout (May 1 to Oct 31)	State Bull Trout (May 1 to Oct 31)	Cutthroat Trout Spawning (week post hydrograph peak to July 31)	Bull Trout Spawning (Sept 1 to Oct 31)
Bear Creek	33.2	1.1	29.9	9.8
Little Bear Creek	23.4	0.0	19.5	9.8
Blackjack Creek	44.6	33.2	46.0	42.6
Harvey Creek	48.4	32.1	43.7	41.0
Big Creek	56.0	46.2	68.3	52.5
E. F. Big Creek	63.0	54.3	64.6	54.1
Boulder Creek	54.9	45.7	58.5	41.0
Marble Creek	56.5	47.3	53.7	52.5
Fishhook Creek	54.9	48.4	56.1	52.5
Loop Creek	52.7	45.7	29.9	42.6
N. F. St. Joe River	58.2	51.1	53.7	55.7
Bluff Creek	48.4	38.6	28.7	24.6
Gold Creek	42.9	33.7	29.4	23.0
Beaver Creek	47.3	41.3	45.6	24.6
Heller Creek	45.6	32.6	21.8	24.6
Sherlock Creek	44.6	40.8	37.2	27.9
Yankee Bar Creek	45.1	33.2	23.1	19.7
California Creek	38.0	16.3	21.8	18.0
Medicine Creek	33.4	0.5	0.0	0.0
Upper St. Joe River	43.5	37.0	33.3	27.9

Biological and Other Data

The existing biological data include bacteria, macroinvertebrate, and fisheries data. Bacteria data were collected by DEQ.

-- Bacteria

Five streams (Bear, Little Bear, Blackjack, Harvey, and Tank Creeks) are listed for bacteria. An assessment of *Escherichia coli* (*E. coli*) was conducted during June, July, and August 2000. As part of the assessment, the presence of significant livestock concentrations in the watersheds was assessed. No significant concentrations of livestock were found in any of the five watersheds. Results of *E. coli* tests of water samples are provided in Table 11. As shown in Table 11, none of the monitoring sites exceeded the geometric mean standard of 126 organisms/100 mL for primary or secondary contact recreation.

Table 11. *Escherichia coli* (colonies per 100 mL) presence measurements during summer 2000.

Stream	6/27/00	7/26/00	8/2/00	Mean
Bear Creek	<1[1]	2	<1	1
Little Bear Creek	1	5	3	3
Blackjack Creek	3	<1	<1	2
Harvey Creek	4	4	2	3
Tank Creek	8	9	<1	6

[1]Quality assurance/quality control blank samples <1; less than one treated as 0.5 in means

-- Macroinvertebrate and habitat index data

Stream macroinvertebrate, stream fish, and stream habitat scores for water bodies in the St. Joe River subbasin are provided in Table 12. As described in DEQ's *Water Body Assessment Guidance* (WBAGII) (Grafe *et al*. 2002), the indices are based on the northern mountains ecoregion. The index values are averaged to develop the WBAGII score for the available indices. At least two indices are necessary to make a determination. Average values of 2 or greater indicate support of the cold water use, while values lower than 2 indicate nonsupport.

Table 12. Stream macroinvertebrate, fish, and habitat indices data for the St. Joe subbasin.

a) Listed streams

Stream	SMI[1]	SMI Score	SFI[2]	SFI Score	SHI[3]	SHI Score	WBAGII Score (Average SMI + SFI + SHI)	Support Status[4]
Bear Creek	41.21	1	88	3	53	1	1.7	NFS
Beaver Creek	72.10	3	-	-	88	3	3	FS
Bird Creek	-	-	95	3	30	1	2	FS
Blackjack Creek	45.57	1	53	1	82	3	1.7	NFS
East Fork Bluff Creek	45.08	1	92	3	75	3	2.3	FS
Fishhook Creek	45.25	1	82	3	45	1	1.7	NFS
Fly Creek	81.87	3	-	-	55	1	2	FS
Gold Creek	73.51	3	91	3	68	3	3	FS
Harvey Creek	72.88	3	-	-	78	3	3	FS
Little Bear Creek	40.16	1	80	2	58	3	2	FS
Loop	-	-	83	3	-	-	-	ND
Mica Creek	63.72	3	82	3	55	2	2.0	FS
Mosquito Creek	74.03	3	87	3	52	1	2.3	FS
Tank Creek	-	-	-	-	16	1	-	ND

b) Unlisted streams

Stream	SMI[1]	SMI Score	SFI[2]	SFI Score	SHI[3]	SHI Score	WBAG II Score (Average SMI + SFI + SHI)	Support Status[4]
Bond Creek	59.62	2	61	1	45	1	1.3	NFS
Hugus Creek	72.00	3	-	-	55	1	2	FS
Marble Creek	48.01	1	-	-	60	2	1.5	NFS
Toles Creek	48.19	1	-	-	56	2	1.5	NFS
Norton Creek	61.06	2	87	3	82	3	2.7	FS
Hobo Creek	71.22	3	74	2	86	3	2.7	FS
DaVeggio Creek	61.97	2	88	3	73	3	2.7	FS
Sisters Creek	48.72	1	95	3	64	2	2	FS
Alpine Creek	64.41	3	90	3	76	3	3	FS
Prospector Creek	53.29	1	96	3	73	3	2.3	FS
Copper Creek	76.76	3	-	-	58	2	2.5	FS
Bruin Creek	78.28	3	96	3	76	3	3	FS
Quartz Creek	63.45	3	89	3	77	3	3	FS
Eagle Creek	67.80	3	97	3	75	3	3	FS
Nugget Creek	-	-	97	3	66	3	3	FS
Timber Creek	51.58	1	89	3	84	3	2.3	FS
Skookum Creek	-	-	95	3	79	3	3	FS
Upper St. Joe River	85.47	3	-	-	53	1	2	FS
Big Creek	48.92	1	72	3	56	1	1.7	NFS

[1]Stream Macroinvertebrate Index
[2]Stream Fish Index
[3]Stream Habitat Index
[4]FS – full support; NFS – not full support; ND – not determined

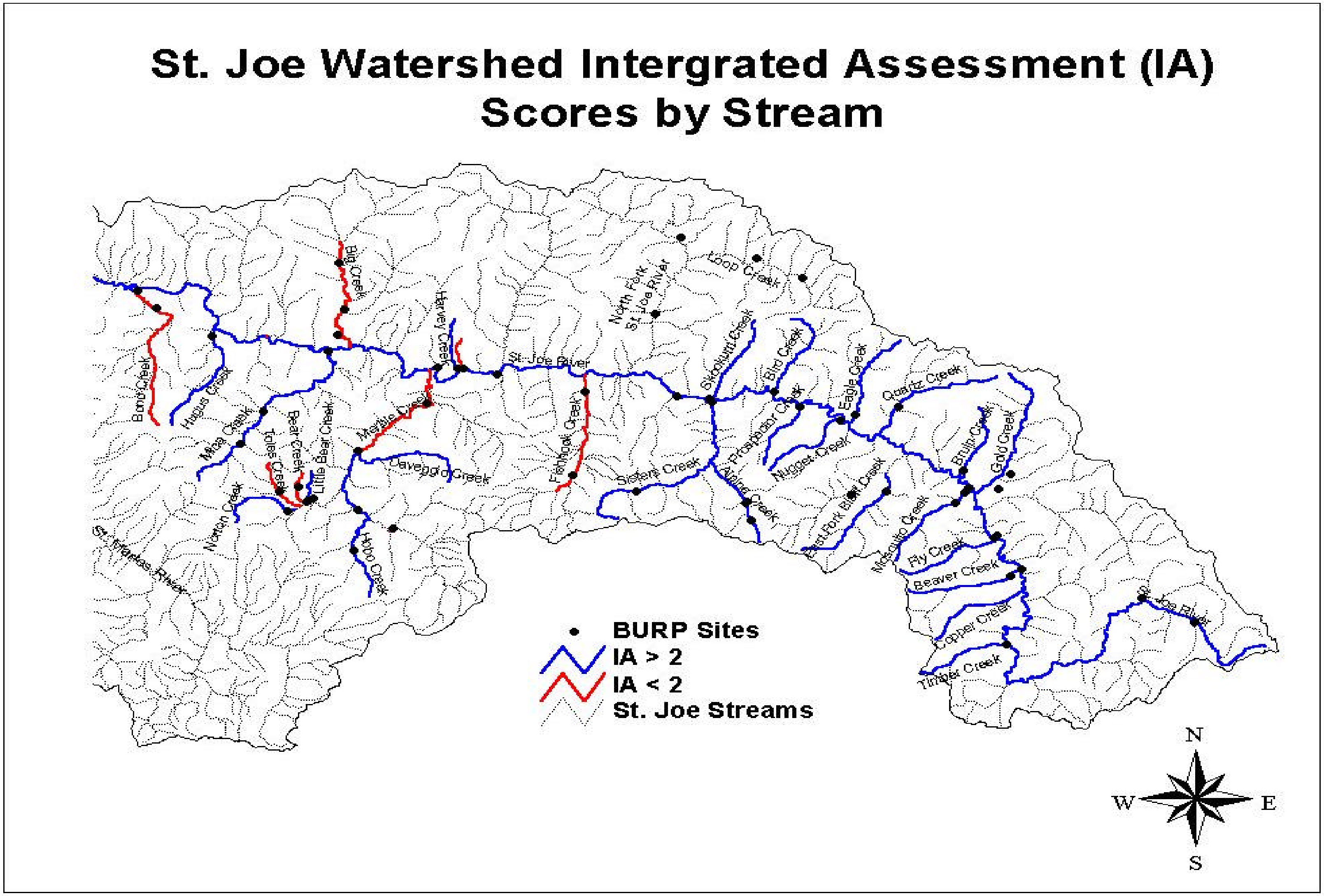

Figure 7. Stream Macroinvertebrate and Habitat Indices Scores at BURP Stations in the St. Joe River Subbasin

-- Additional fisheries data

Electrofishing data from subbasin streams that are either not developed or have little development indicate that between 0.1 and 0.5 fish per square meter per hour of electrofishing effort are typical (Table 13). Fishhook, Gold, Loop, and Mica Creeks are well below this range, while the remaining listed streams are in the range. No data are available for Harvey and Tank Creeks. These are high gradient tributaries to the river where electrofishing is difficult. All streams for which data were collected had at least two age classes present. Most streams had representatives of three age classes. Young of the year were present in all streams where DEQ data were collected. Sculpin are present in most streams in numbers ranging from 0.2 to 0.5 fish per square meter per hour of electrofishing effort. Sculpin were not present in Blackjack Creek, which, like Harvey and Tank Creeks, is a high gradient stream. Tailed frogs were found in all streams where data were collected, while salamanders were present in most of the streams.

Many unlisted streams had the expected number of trout and sculpin per square meter per hour of electrofishing effort (Table 13). Exceptions include Bond, Hobo, DaVeggio, Copper, Quartz, and Big Creeks. Most of the streams had three age classes, including young of the year. Hobo and Big Creeks each had a single age class, while Hobo, DaVeggio, and Big Creeks did not have young of the year detected. Sculpin were typically measured in the range of 0.2 to 0.5 fish per square meter per hour of electrofishing effort. A few streams had slightly lower numbers, but in Big Creek sculpin numbers were extremely low. Tailed frogs were detected in many streams and salamanders in a few.

The results indicate that many of the listed and unlisted streams have numbers of trout and sculpin typically found in streams of the Northern Rocky Mountain Ecosystem. The presence of three age classes and young of the year in most streams indicates salmonid spawning is supported. Fishhook, Gold, Loop and Mica Creeks have low fish numbers that could suggest water quality impairment. The streams of Marble Creek also appear to have low trout numbers, fewer age classes and the absence of young of the year. Boulder Creek is an exception. Big Creek has exceptionally low trout and sculpin numbers. Since this watershed has a very low level of development, these values are either a measurement artifact or the result of some natural impact.

Table 13. Fish population per unit stream area of the streams of the St. Joe River subbasin.

a) Water quality limited streams[1]

Stream	HUC Number	Salmonids (fish/m^2/hr effort)	Number of Salmonid Age Classes and Young of the Year	Sculpin (fish/m^2/hr effort)	Presence of Salamanders and/or Tailed Frogs
Bear Creek	17010304 7606	0.478	2 - YOY	0.517	Yes (TF)
Beaver Creek	17010304	0.21	2 – YOY	0.17	Yes (TF)
Bird Creek	17010304 3614	0.117	3 - YOY	0.285	Yes (TF, S)
Blackjack Creek	17010304 7577	0.734	3 - YOY	0.000	Yes (TF, S)
East Fork Bluff Creek	17010304 5022	0.117	3 - YOY	0.165	Yes (TF)
Fishhook Creek	17010304 3608	0.054	2 - YOY	0.271	Yes (TF, S)
Gold Creek	17010304 3622	0.036	3 - YOY	0.229	Yes (TF)
Harvey Creek	17010304 7576	N.D.	N.D.	N.D.	N.D.
Little Bear Creek	17010304 7607	0.137	2 - YOY	1.096	Yes (TF, S)
Loop Creek	17010304 5620	0.046	3 - YOY	0.396	Yes (TF, S)
Mica Creek	17010304 3601	0.042	3 - YOY	0.355	Yes (TF, S)
Mica Creek[2]	17010304 3601	0.201	3	0.734	N.D.
WF Mica Creek[2]	17010304 3601	0.190	2 - YOY	0.513	N.D.
Mosquito Creek	17010304 3621	0.12	3 – YOY	0.28	Yes (TF, S)
Tank Creek	17010304 7575	N.D.	N.D.	N.D.	N.D.

[1]Data from DEQ Beneficial Use Reconnaissance Program except where otherwise noted; N.D. - no data; YOY – young of the year; TF – tailed frogs; S – salamanders
[2] Average of Potlatch Corporation data collected four separate years 1995-2000

b) Streams not listed as water quality limited[1]

Stream	HUC Number	Salmonids (fish/m^2/hr effort)	Presence of Three Salmonid Age Classes	Sculpin (fish/m^2/hr effort)	Presence of Tailed Frogs and/or Salamanders
Bond Creek	17010304 3598	0.06	3 – YOY	0.24	Yes (TF)
Hugus Creek[2]	17010304	0.03	2 - YOY	0.12	N.D.
Norton Creek	17010304 7604	0.06	2 – YOY	0.30	Yes (TF)
Hobo Creek	17010304	0.02	1	0.14	Yes (TF)
DaVeggio Creek	17010304 3609	0.09	3	0.15	Yes (TF)
Boulder Creek	17010304	0.51	2 – YOY	N.D.	Yes (TF)
Sisters Creek	17010304 3613	0.25	3 – YOY	0.70	Yes (TF)
Prospector Creek	17010304 3615	0.10	3 – YOY	0.24	None
Nugget Creek	17010304	0.30	3 – YOY	0.33	Yes (TF)
Copper Creek	17010304	0.07	3 – YOY	0.39	None
Timber Creek	17010304	0.04	2 – YOY	0.14	Yes (TF)
Bruin Creek	17010304 3620	0.10	3 – YOY	0.15	None
Quartz Creek	17010304 3618	0.06	4 – YOY	0.25	Yes (S)
Eagle Creek	17010304 3617	0.10	3 – YOY	0.11	Yes (TF, S)
Skookum Creek	17010304	0.10	3 – YOY	0.25	Yes (TF)
Big Creek	17010304 3602	0.01	1	0.07	None

[1]Data from DEQ Beneficial Use Reconnaissance Program except as otherwise noted; N.D. - no data; YOY – young of the year; TF – tailed frogs; S – salamanders
[2] Potlatch Corporation data collected one time in 1995

-- Sedimentation data

Available sedimentation data include measurements of riffle armor stability and residual pool volume. Sedimentation model data are also available.

Riffle Armor Stability Indices

A quantitative index of streambed instability is the Riffle Armor Stability Index (RASI) (Kappesser 1993). The measurement consists of a 200 particle count and size measurement on a transect across a stream riffle using the methods of Wolman (1954). With this information, a particle size distribution curve is developed for the riffle. A RASI involves an additional measurement of the 30 largest particles found deposited on the point deposition bar located immediately downstream of the riffle. The RASI value is the percentage of particles in the distribution curve smaller than the mean size of the largest particles deposited on the point bar.

Since the largest particles on the point bar represent the largest stream bed particles moved by the stream during the most recent channel altering event, the RASI provides an assessment of the percentage of the stream bed materials mobilized during the event. A RASI value provides an assessment of relative streambed stability. Values in the range of 28-60 with a mean of 44 have been found in unmanaged streams of the upper St. Joe River basin, which are believed to have high relative stability. These watersheds have very few or no roads and the last general disturbance of the area was the 1910 wildfire (Cross and Everest 1995). Additional RASI scores have not been developed for managed streams of the St. Joe River watershed. A mean RASI score of 44 indicates that an average of 44% of the stream bed particles move during a two-year channel forming discharge event. A high score of 60 means that, at most, 60% of the particles are mobilized. These streambeds are composed primarily of coarse gravel and larger particles. These results from unmanaged watersheds suggest high bed mobility is a natural feature of the dominant Belt terrain. Since the channel-forming events, which move the bed materials, occur in winter or spring, fall spawning fish would be at a disadvantage spawning in streams in which 44-60% of the riffle moves at least every other year.

Residual Pool Volume

Residual pool volume is a measure of the amount pools in a stream channel. In theory, it is an estimate of the amount of the stream bed that would hold water at zero discharge. Residual pool volume can be estimated from stream channel measurements collected by survey crews. The estimates are typically standardized on a volume per stream mile basis. Since the stream width affects the amount of pool volume possible, residual pool volume data are typically ordered based on the bank full width of the stream. Bank full width is the best measure of the typical stream discharge and ability to scour pools (DEQ 1989).

The residual pool data for the water quality limited listed segments of the St. Joe River subbasin are provided in Table 14. The residual pool volumes of several additional streams of the St. Joe River subbasin are provided in Table 15. Streams in both tables are listed in order of increasing bank full width.

Table 14. Residual pool volume of the water quality limited segments of the St. Joe River subbasin.[1]

Stream	HUC Number	Bank Full Width (feet)	Residual pool Volume (cubic feet/mile)
Bear Creek	17010304 7606	7.1	4,531
Tank Creek	17010304 7575	7.2	N.D. (dry)
Little Bear Creek	17010304 7607	9.2	9,446
Blackjack Creek	17010304 7577	11.7	5,190
Harvey Creek	17010304 7576	15.0	4,417
Fly Creek	17010304	19.4	61,098
Beaver Creek	17010304	21.7	180,003
Bird Creek	17010304 3614	23.9	5,070
Mosquito Creek	17010304 3621	26.0	55,136
East Fork Bluff Creek	17010304 5022	33.2	26,614
Fishhook Creek	17010304 3608	33.3	17,329
Gold Creek	17010304 3622	35.7	79,910
Mica Creek	17010304 3601	38.8	14,526
Loop Creek	17010304 5620	41.3	39,521

[1]Data from DEQ Beneficial Use Reconnaissance Program; N.D. - no data

Table 15. Residual pool volume of the unlisted stream segments of the St. Joe River subbasin.[1]

Stream	HUC Number	Bank Full Width (feet)	Residual Pool Volume (cubic feet/mile)
Norton Creek	17010304 7604	19.2	12,462
Bruin Creek	17010304 3620	19.4	14,905
Copper Creek	17010304	20.2	87,743
Nugget Creek	17010304	24.6	0
Siwash Creek	17010304	25.0	81,279
DaVeggio Creek	17010304 3609	25.5	0
Bussel Creek	17010304	25.9	92,586
Prospector Creek	17010304 3615	27.1	15,112
Timber Creek	17010304	27.6	27,259

Table 15, continued.

Skookum Creek	17010304	28.5	31,852
Sisters Creek	17010304 3613	31.8	25,228
Quartz Creek	17010304 3618	32.1	96,726
Eagle Creek	17010304 3617	33.2	46,782
Bond Creek	17010304 3598	33.3	22,601
Hobo Creek	17010304	34.3	7,663
Upper St. Joe River	17010304	39.7	191,768
Boulder Creek	17010304	45.1	92,373
N. F. St. Joe River	17010304	46.3	110,951
Hugus Creek	17010304 3600	48.9	0
Big Creek	17010304 3602	62.8	60,595
Marble Creek	17010304 3604	72.3	143,821

[1]Data from DEQ Beneficial Use Reconnaissance Program

Point Sources of Sediment

There are no point sources of sediment on the sediment-listed segments of the St. Joe River subbasin. There are no point discharges of sediment to the St. Joe River above the St. Maries River confluence. The St. Maries Wastewater Treatment Plant discharges to the river within the Coeur d'Alene Reservation.

Sediment Modeling

Sediment monitoring in-stream is a very time consuming and costly undertaking. In-stream sediment data collection costs estimated by URS Greiner for the Spokane River in 2001 show that in-stream sediment monitoring completed quarterly at five sites would cost $400,000 (URS Greiner 2001a). Sediment monitoring should be conducted at least annually at a site for seven years to develop a database that accounts for the variance of discharge effects on sediment yield and transport from year to year. From the URS Greiner figures, the investment required to conduct annual sediment monitoring for seven years is estimated at $140,000 per site. The time necessary and costs involved do not make sediment monitoring a viable approach for DEQ. A sediment modeling approach uses coefficients developed over long periods in paired watersheds. A sediment modeling approach is the most time and cost efficient approach to estimating sediment for the purposes of TMDLs.

Land Use Data

Sediment yield is estimated from land use data developed from USFS, IDL, and Potlatch Corporation Geographical Information Systems (GIS). Timber stand coverage was assessed for fully stocked and non-stocked lands. Fire coverage developed by the USFS was used to develop data on areas that experienced two wildfires. Forest road coverage developed by USFS, IDL, Potlatch Corporation, and the Bureau of Land Management was used to develop the forest road mileage, road density, road crossings, and encroaching roads data. Cumulative watershed effects (CWE) analyses provide road scores and mass wasting data for all the 303(d) listed watersheds. Road scores and mass wasting data are not available for the Bond, Hugus, and Marble Creek watersheds where CWE analysis will not be completed. In these cases, average road scores and mass wasting data were used from adjacent watersheds for the purpose of assessing sedimentation. These values are reported on Tables 16a and 16b.

Sediment Yield and Export

Sediment yields were developed separately for forestlands, forest roads, and stream bank erosion. No significant agricultural land or highway corridor acreage occurs in the subject watersheds. Sediment export to the stream system was assumed to be 100%. Additional assumptions and documentation of the sediment model are provided in Appendix C. Sediment yield values for 303(d) listed segments and streams draining to the St. Joe River are reported in Tables 18a and 18b, respectively.

Forestland Sediment Yield

Forestland sediment yield was based on mean sediment production coefficients developed from in-stream sediment measurements on Belt geologies of northern and north central Idaho (Patten 1999). The coefficient is 15 tons per square mile per year with a range from 12-17 for the Belt Supergroup geology, which predominate in the St. Joe River watershed. The mean values were used for conifer and sparse conifer forests. The highest values in the range were used for stands that were not fully stocked with trees. Areas twice burned by wildfires were assigned values to reflect sedimentation from burned areas. All of the mean values were divided by 640 acres per square mile. Sediment yield from forestland was estimated by applying the sediment yield coefficients (Table 17) to the land area in each forest category (Table 16).

Table 16. Land use.

a) 303(d) listed streams

Sediment –303(d) listed watersheds in the St. Joe River subbasin

Land Use

Subwatershed	Bear[1]	Bird	Blackjack	East Fork Bluff	Fishhook[2]	Gold	Harvey	Loop[3]	Mica	Tank
Forest land (acres)	1,693.70	8,540.13	733.20	9,281.86	21,835.00	14,972.11	473.80	19,018.28	23,291.75	969.10
Unstocked forest (acres)	371.10	706.79	602.30	583.34	4,092.38	2,914.53	1,161.90	1,320.99	2,874.16	438.80
Total forested acreage	**2,064.80**	**9,246.92**	**1,335.50**	**9,865.20**	**25,927.38**	**17,886.64**	**1,635.70**	**20,339.27**	**26,165.91**	**1,407.90**
Double fires (acres)	0.00	1.23	0.00	0.00	295.58	0.00	33.70	3,926.79	0.00	0.00
Road Data										
Forest roads (miles)	17.10	42.99	4.60	30.46	239.28	65.01	3.50	55.22	157.12	6.00
Ave. road density (miles/mile^2)	5.30	2.98	2.20	1.98	5.91	2.33	1.37	1.74	3.84	2.73
Road crossing number	65.00	27.00	1.00	30.00	184.00	65.00	1.00	41.00	400.00	2.00
Road crossing frequency	3.80	0.63	0.22	0.98	0.77	1.00	0.29	0.74	2.55	0.33
Mass Failure (tons/year)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	219.90	0.00	0.00
Encroaching forest roads (miles)	2.30	1.22	0.09	0.86	9.07	2.13	0.11	2.32	12.31	0.02
Mean bankfull width + two 3' banks	14.20	29.90	17.70	39.20	39.20	41.70	21.00	47.30	44.80	13.20
CWE[4] score	14.00	10.00	10.00	12.00	18.00	11.00	10.00	17.00	12.00	10.00
tons/mi CWE	3.03	2.23	2.23	2.61	4.07	2.42	2.23	3.78	2.61	2.23
Miles CWE	5.70	14.29	4.60	7.70	31.76	33.38	3.50	28.10	27.30	0.01

[1]Bear Watershed includes Little Bear Watershed.
[2]Fishhook Creek includes Lick Creek; CWE score for Fishhook Creek used.
[3]Loop Watershed includes Loop Creek + Loop Creek sidewalls. CWE score from Loop Creek was used.
[4]Cumulative Watershed Effects, Idaho Department of Lands.

b) Streams draining to the St. Joe River

Sediment -Bond, Hugus and Marble Watersheds

Land Use

Subwatershed	Bond	Hugus	Marble (upper)	Eagle	Homestead	Bussel	Hobo	DaVeggio	Boulder	Marble (lower)
Forest land (acres)	15,542.90	8,717.40	16,139.90	4,798.00	6,605.90	11,435.10	6,242.10	6,586.80	10,036.10	19,967.10
Unstocked forest (acres)	790.00	410.90	786.50	940.80	314.40	1,143.70	186.30	528.20	1,488.30	1,915.10
Total forested acreage	**16,332.90**	**9,128.30**	**16,926.40**	**5,738.80**	**6,920.30**	**12,578.80**	**6,428.40**	**7,115.00**	**11,524.40**	**21,882.20**
Double fires (acres)	0.00	0.00	1,193.60	68.40	1,107.70	410.30	272.20	281.50	2.90	3,769.20
Road Data										
Forest roads (miles)	116.90	106.30	164.50	79.70	27.10	90.20	34.40	47.70	124.00	164.50
Ave. road density (miles/mile^2)	4.58	7.45	6.22	8.89	2.51	4.59	3.42	4.29	6.89	4.81
Road crossing number	97.00	81.00	18.00	90.00	34.00	71.00	20.00	36.00	82.00	174.00
Road crossing frequency	0.83	0.76	0.11	1.13	1.25	0.79	0.58	0.75	0.66	1.06
Mass Failure (tons/year)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Encroaching Forest Roads (mi)	4.20	2.60	0.42	4.00	0.90	2.30	0.50	0.80	2.90	5.90
Mean Bankfull width + two 3' banks	39.30	54.90	78.30	40.30	40.30	31.90	40.30	31.50	51.10	78.30
CWE score (extrapolated)	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00
tons/mile CWE[1]	3.26	3.26	3.26	3.26	3.26	3.26	3.26	3.26	3.26	3.26

[1]Values extrapolated; CWE not performed on these streams.

Table 17. Estimated sediment yield coefficients for forestland uses based on the geology of the watersheds (Belt Supergroup).

Land Use Type Sediment Export Coefficient	Sediment Export Coefficient
Conifer forest (tons/acre/year)	0.023
Non-stocked Forest (tons/acre/year)	0.027
Double fire Burn (tons/acre/year)	0.004

-- Road Surface Sediment

Forest road fine sediment yield was estimated using a relationship between CWE score and the sediment yield per mile of road (Appendix C). The relationship was developed for roads on a Kaniksu granite geology in the LaClerc Creek watershed (McGreer 1998). Its application to roads on Belt geology overestimates sediment yields from these systems. The watershed CWE score was used to develop a sediment yield in tons per mile, which was multiplied by the estimated road mileage within 200 feet of a road crossing (Table 18). It was assumed that all road surface sediment was delivered to the stream system. These are conservative over-estimates of actual delivery.

-- Road failure sediment

Forest roads can fail into streams. Delivery from road failures is estimated directly in the CWE assessments. Sediment delivery was applied directly for the watersheds where CWE analysis was applied. In those watersheds where CWE data are not available (Bond and Hugus Creeks and most of Marble Creek), average values from adjacent watersheds were applied. Road sediment yield was annualized based on high discharge events with an estimated 10 years return time.

-- Road encroachment sediment

Sediment yield resulting from road encroachment (Tables 18a and b) was modeled based on a set cross-section for each watershed. The cross-section is based on the mean channel bankfull width. The model assumes 0.25-inch erosion from the channel and the banks of stream reaches where roads encroach within 50 feet of the stream. The sediment contribution from these sources was annualized based on large discharge events every 10 years.

Stream Bank Erosion

Stream bank erosion yields sediment to the streams where such erosion occurs. The bank recession rate and height and length of eroding banks were measured using Natural Resource Conservation Service methods for streams with significant bank erosion. The sedimentation rate from eroding banks was estimated based on these measurements (Sampson 1999). Bank erosion was found only in the Loop and Mica Creek watersheds.

Sedimentation Estimates

Sedimentation estimates were developed by totaling the various sediment yields annualized for delivery to the channels based on a 10-year event (Tables 18a and b).

Estimated total sediment delivery from individual streams is compared in Table 19, which shows the percent above background sedimentation rates expected from each watershed. Background sedimentation rates reflect a watershed entirely vegetated with coniferous forest and devoid of roads (0.023 tons/acre/year multiplied by the total acreage of the watershed). The small Bear/Little Bear watershed was incorporated into the Bussel Creek watershed for the purposes of this analysis. Sediment model results indicate that Bear, Fishhook, and Mica Creeks exceed background sediment yield by greater than 50%. Sediment yield greater than 50% above background is used as a coarse filter to segregate streams in which sediment may be impairing water quality (Washington Forest Practices Board 1995). Analyses of the model outputs (Table 18) indicate that it is the encroachment of roads into the floodplain, and to a lesser extent, road crossings, that are responsible for the excess sedimentation.

Additional unlisted streams in the St. Joe River subbasin were modeled for sedimentation. Sediment modeling in these watersheds required some assumptions because CWE data was not collected for these streams. It was assumed the streams would have CWE road scores and mass failure rates similar to those of adjacent watersheds that received CWE analysis. The comparison of the modeled sedimentation rates with the estimated background sedimentation is provided in Table 19. Hugus, Eagle, Boulder, and Lower Marble Creeks have sedimentation rates above the threshold value of 50%. The Boulder Creek watershed is only slightly above the threshold, while the Eagle Creek watershed is substantially above the threshold (>100%), and above the rate at which water quality problems are expected (Washington Forest Practices Board 1995).

The watersheds of Bird, East Fork Bluff, Gold, Harvey, Hobo, and DaVeggio Creeks have sedimentation rates well below the threshold of concern and have WBAGII scores (? 2) indicating full support of beneficial uses. The Mica and Eagle watersheds have sedimentation rates at which water quality problems are expected. Hugus, Boulder, Bear, and Fishhook Creeks have modeled sedimentation rates in the gray area where the impact to water quality is uncertain. Combined, the entire Marble Creek watershed provided a modeled sedimentation rate of 3,150.4 tons per year, while the estimated background rate would be 2,213.1 tons per year. The entire watershed is 42.4% above the background sedimentation rate, and is below the threshold of concern. The Boulder, Eagle, Lower Marble, and Hugus watersheds should be the subject of further investigation before additional decisions are made concerning the water quality of these streams.

Table 18. Estimated sediment yield.

a) 303(d) listed segments

Sediment Yield -St. Joe River Subbasin 303(d) Listed Segments

Subwatershed	Bear	Bird	Blackjack	East Fork Bluff	Fishhook	Gold	Harvey	Loop	Mica	Tank
Conifer forest (tons/yr)(fine)	23.4	135.5	5.1	87.5	231.0	241.1	2.9	286.5	235.7	6.7
(coarse)	15.6	60.9	11.8	126.0	271.2	103.3	8.0	150.9	300.0	15.6
Unstocked forest (tons/yr)(fine)	6.0	13.2	4.9	6.5	50.8	55.1	8.5	23.4	34.1	3.6
(coarse)	4.0	5.9	11.4	9.3	59.7	23.6	22.9	12.3	43.5	8.3
Double fires (tons/yr)(fine)	0.0	0.0	0.0	0.0	0.5	0.0	0.0	10.3	0.0	0.0
(coarse)	0.0	0.0	0.0	0.0	0.6	0.0	0.1	5.4	0.0	0.0
Total yield (tons/yr)(fine)	**29.4**	**148.7**	**10.0**	**94.0**	**282.3**	**296.2**	**11.4**	**320.2**	**269.8**	**10.3**
(coarse)	**19.6**	**66.8**	**23.2**	**135.3**	**331.5**	**126.9**	**31.0**	**168.6**	**343.5**	**23.9**
County, Forest, and Private Road Sediment Yield										
Subwatershed	Bear	Bird	Blackjack	East Fork Bluff	Fishhook	Gold	Harvey	Loop	Mica	Tank
Surface fine sediment (tons/year)	14.9	4.6	0.2	5.9	56.7	11.9	0.2	11.7	79.2	0.3
Road failure fines (tons/year)[1]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	28.3	0.0	0.0
Road failure coarse (tons/year)[1]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	14.9	0.0	0.0
Encroachment fines (tons/year)[2]	17.5	22.4	0.9	12.3	145.9	55.5	0.6	64.1	216.4	0.1
Encroachment coarse (tons/yr)[2]	11.7	10.1	2.2	17.7	171.2	23.8	1.5	33.8	312.3	0.2
Forest Roads										
Total fine yield (tons/year)	**32.4**	**27.0**	**1.1**	**18.2**	**202.6**	**67.4**	**0.8**	**104.1**	**295.6**	**0.4**
Total coarse yield (tons/year)	**11.7**	**10.1**	**2.2**	**17.7**	**171.2**	**23.8**	**1.5**	**48.7**	**312.3**	**0.2**
Total sediment (tons/year)	93.1	252.6	36.5	265.2	987.6	514.3	44.7	641.6	1221.2	34.8
Percent Fines[3]	0.66	0.69	0.30	0.42	0.49	0.71	0.27	0.66	0.46	0.31
Percent Coarse	0.34	0.31	0.70	0.58	0.51	0.29	0.73	0.34	0.54	0.69

[1]Uses mass failure and delivery rates developed from Cumulative Watershed Effects protocol prorated for road miles and annualized;

Tons delivered x (road mileage/road mileage assessed)/10 years

[2]Assume: 0.25-inch from 3 feet banks; density = 2.6 grams per cubic centimeter

[3]from weighted average of fines and stones in soils groups

b) Streams draining to St. Joe River

Sediment Yield-Bond, Hugus, and Marble Subwatersheds

Subwatershed	Bond	Hugus	Upper Marble	Eagle	Homestead	Bussel	Hobo	DaVeggio	Boulder	Lower Marble
Conifer forest (tons/year)(fine)	175.2	98.2	133.6	62.9	53.2	157.8	58.9	56.1	85.4	169.9
(coarse)	182.3	102.3	237.6	47.5	98.8	105.2	84.7	95.4	145.4	289.3
Unstocked forest (tons/year)(fine)	0.0	5.4	7.6	14.5	3.0	18.5	2.1	5.3	14.9	19.1
(coarse)	10.9	5.7	13.6	0.0	5.5	12.4	3.0	9.0	25.3	32.6
Double fires (tons/year)(fine)	0.0	0.0	1.7	0.2	1.6	1.0	0.4	0.4	0.0	5.6
(coarse)	0.0	0.0	3.1	0.1	2.9	0.7	0.6	0.7	0.0	9.5
Total yield (tons/year)(fine)	**175.2**	**103.6**	**142.9**	**77.6**	**57.8**	**177.3**	**61.4**	**61.8**	**100.3**	**194.6**
(coarse)	**193.2**	**108.0**	**254.3**	**47.6**	**107.2**	**118.3**	**88.3**	**105.1**	**170.7**	**331.4**

Forest and Private Road Sediment Yield

Subwatershed	Bond	Hugus	Upper Marble	Eagle	Homestead	Bussel	Hobo	DaVeggio	Boulder	Lower Marble
Forest road										
Surface fine sediment (tons/year)	24.0	20.0	4.4	22.2	8.4	17.5	4.9	8.9	20.3	43.0
Road failure fines (tons/year)[1]	5.4	4.9	5.6	4.3	0.9	5.1	1.3	1.7	4.3	5.7
Road failure coarse (tons/year)[1]	5.6	5.1	9.9	3.2	1.7	3.4	1.9	2.8	7.3	9.7
Encroachment fines (tons/year)[2]	72.1	62.4	10.6	82.0	11.3	39.3	7.4	8.3	48.9	152.5
Encroachment coarse (tons/year)[2]	75.1	64.9	18.9	61.8	21.0	26.2	10.6	14.2	83.3	259.6
Total fine yield (tons/year)	**101.5**	**87.3**	**20.6**	**108.5**	**20.6**	**61.9**	**13.6**	**18.9**	**73.5**	**201.2**
Total coarse yield (tons/year)	**80.7**	**70.0**	**28.8**	**65.0**	**22.7**	**29.6**	**12.5**	**17.0**	**90.6**	**269.3**
Total sediment (tons/year)	550.6	368.9	446.6	298.7	208.3	387.1	175.8	202.8	435.1	996.5
Percent Fines[3]	0.50	0.52	0.37	0.62	0.38	0.62	0.43	0.40	0.40	0.40
Percent Coarse	0.50	0.48	0.63	0.38	0.62	0.38	0.57	0.60	0.60	0.60

[1]Uses mass failure and delivery rates developed from Cumulative Watershed Effects protocol prorated for road miles and annualized;
Tons delivered x (road mileage/road mileage assessed)/10 years
[2]Assume: 0.25-inch from 3 feet banks; density = 2.6 grams per cubic centimeter
[3]from weighted average of fines and stones in soils groups

Table 19. Estimated background and sediment export.

a) 303(d) listed segments

Sediment Export - St. Joe River 303(d) Listed Segments

Subwatershed	Bear[1]	Bird	Blackjack	East Fork Bluff	Fishhook	Gold	Harvey	Loop	Mica	Tank
Land use fines export (tons/year)	29.4	148.7	9.9	94.0	282.4	296.1	11.4	320.2	269.9	10.2
Land use coarse export (tons/year)	19.6	66.8	23.2	135.2	331.5	126.9	31.0	168.6	343.5	23.9
Road fines export (tons/year)	32.4	27.0	1.1	18.3	202.6	67.4	0.7	104.1	295.6	0.4
Road coarse export (tons/year)	11.7	10.1	2.2	17.7	171.2	23.8	1.5	48.7	312.3	0.2
Bank erosion fines (tons/year)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Bank erosion coarse (tons/year)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total fines export (tons/year)	61.8	175.7	11.0	112.3	485.0	363.5	12.1	424.3	565.5	10.6
Total coarse export (tons/year)	31.3	76.9	25.4	152.9	502.7	150.7	32.5	217.3	655.8	24.1
Total (tons/year)	**93.1**	**252.6**	**36.4**	**265.2**	**987.7**	**514.2**	**44.6**	**641.6**	**1,221.3**	**34.7**
Natural Background	**47.5**	**212.7**	**30.7**	**226.9**	**596.3**	**411.4**	**37.6**	**467.8**	**601.8**	**32.4**
Percent above background	**96.0**	**18.8**	**18.6**	**16.9**	**65.6**	**25.0**	**18.6**	**37.2**	**102.9**	**7.1**

[1]Bear watershed includes Little Bear watershed.

b) Streams draining to the St. Joe River

Sediment Export - Bond, Hugus, and Marble Subwatersheds

Subwatershed	Bond	Hugus	Upper Marble	Eagle	Homestead	Bussel	Hobo	DaVeggio	Boulder	Lower Marble
Land use fines export (tons/year)	175.2	103.7	143.0	77.5	57.7	177.3	61.4	61.7	100.3	194.6
Land use coarse export (tons/year)	193.2	107.9	254.2	47.6	107.2	118.2	88.3	105.1	170.7	331.4
Road fines export (tons/year)	101.5	87.3	20.6	108.4	20.6	61.9	13.6	18.9	73.5	201.1
Road coarse export (tons/year)	80.7	70.0	28.7	65.0	22.7	29.6	12.5	17.0	90.6	269.3
Bank erosion fines (tons/year)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Bank erosion coarse (tons/year)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total fines export (tons/year)	276.7	191.0	163.6	185.9	78.3	239.2	75.0	80.6	173.8	395.7
Total coarse export (tons/year)	273.9	177.9	282.9	112.6	129.9	147.8	100.8	122.1	261.3	600.7
Total (tons/year)	**550.6**	**368.9**	**446.5**	**298.5**	**208.2**	**387.0**	**175.8**	**202.7**	**435.1**	**996.4**
Natural background	**375.7**	**210.0**	**389.3**	**132.0**	**159.2**	**289.3**	**147.9**	**163.6**	**265.1**	**503.3**
Percent above background	**46.6**	**75.7**	**14.7**	**126.1**	**30.8**	**33.8**	**18.9**	**23.9**	**64.1**	**98.0**

Sedimentation Mechanisms

A thorough discussion of the potential sedimentation mechanisms in forested and harvested watersheds is provided in the North Fork Coeur d'Alene River Subbasin Assessment (section 2.3.2.5.3)(DEQ 2001). The discussion will not be repeated for the St. Joe River subbasin, but the mechanisms most active in this watershed will be briefly discussed.

Approximately 47% of the St. Joe watershed is subject to rain-on-snow events, and 47% of the watershed is in the stable snow zone. Although the St. Joe watershed is subject to rain-on-snow discharge events, these are uncommon and not very intense due to its topography. Forestland that is not fully stocked with trees is scarce in the St. Joe watershed, as is land that has been affected by two wildfires in succession. In those watersheds where sedimentation rates are greater than the threshold of concern, roads that encroach on the floodplains, and to a lesser extent, road crossings, are the agents of sediment yield. This appears to cause the exceedences.

Status of Beneficial Uses

The assessed support status of the listed water bodies based on the data available is provided in Table 20. The need for development of a TMDL is noted.

The bacteria limitations of Bear, Little Bear, Blackjack, Harvey and Tank Creeks were disproved. The dissolved oxygen limitations of Blackjack, Harvey, and Tank Creeks were disproved. The nutrient limitation of Gold Creek was disproved. Exceedence of the temperature standard for salmonid spawning was found to occur for significant periods in Bear, Little Bear, Blackjack, and Harvey Creeks. It is probable Tank Creek exceeds the standard as well. Significant exceedences of temperature standards for salmonid spawning and bull trout were found throughout the subbasin. Significant temperature standard exceedences were found in the highest elevation tributaries of the subbasin. These tributaries are known to harbor excellent trout populations. The temperature data indicate that temperature standards may not adequately reflect the requirements of trout. These standards are currently under review by the DEQ. Until the standards issues have been resolved, the temperature TMDLs for the St. Joe River subbasin will be developed.

Sedimentation modeling results indicate that Fishhook, Hugus, and Boulder Creeks have values greater than the 50% above background sedimentation rate threshold of concern, but below the threshold at which water quality impairment is expected (>100%) (Washington Forest Practices Board 1995).

Sediment modeling also indicated that Bear and Lower Marble Creeks are approaching the 100% above background threshold criteria, while Eagle and Mica Creeks are beyond the 100% above background threshold criteria. Sediment TMDLs are recommended for all listed watersheds (Fishhook, Bear, Mica) exceeding the 50% above background threshold. Watersheds that are not listed, but have modeled sediment levels beyond the 50% above background threshold, require further investigation to determine if sediment is adversely affecting aquatic life use.

Table 20. Results of the St. Joe River subbasin assessment based on application of the available data.

Water Body Name and HUC Number	Assessed Support Status	Reasons Segment to be Delisted for Pollutant
Bear/ Little Bear Creeks 17010304 7606 17010304 7607	Sediment modeling indicates cold water use may not be supported by sediment levels; sediment TMDL required. Bacteria monitoring indicates full support of contact recreation. Temperature standard exceeded; temperature TMDL required.	Monitoring of *E.coli* indicates full support of contact recreation standard.
Beaver Creek 17010304 5619	Temperature standard exceeded; temperature TMDL required	N/A
Big Creek 17010304	WBAGII assessment indicates cold water aquatic life not supported, waterbody to be addressed by the 2002-2003 303(d) List.	N/A
Bird Creek 17010304 3614	Sediment modeling indicates cold water use supported by sediment levels.	Sediment modeled at < 50% of background rate; WBAGII score ? 2.
Blackjack Creek 17010304 7577	Sediment modeling indicates cold water use supported by sediment levels. Monitoring of bacteria indicates full support of contact recreation. Dissolved oxygen standard supported. Temperature standard exceeded; temperature TMDL required.	Monitoring of *E.coli* indicates full support of contact recreation standard. Dissolved oxygen above cold water aquatic life standard. Sediment modeled at < 50% of background rate and SHI score ? 2.
Bluff Creek 17010304 5022	Temperature standard exceeded; temperature TMDL required.	N/A
Bond Creek 17010304	WBAGII assessment indicates cold water aquatic life not supported, waterbody to be addressed by the 2002-2003 303(d) List.	N/A
Boulder Creek 17010304	Sediment modeling indicates cold water use may not be supported by sediment levels; further investigation required to determine if aquatic life use is adversely affected.	N/A
Eagle Creek 17010304 3617	WBAGII assessment indicates cold water aquatic life supported, but sediment modeling indicates sediment yield high; further investigation required to determine if aquatic life use is adversely affected.	N/A
East Fork Bluff Creek 17010304 5022	Sediment modeling indicates cold water use supported by sediment levels.	Sediment modeled at < 50% of background rate; WBAGII score ? 2.
Fishhook Creek 17010304 3608	Sediment modeling indicates cold water use may not be supported by sediment levels; sediment TMDL required. Temperature standard exceeded; temperature TMDL required.	N/A
Fly Creek 17010304 2016	Temperature standard exceeded; temperature TMDL required.	N/A
Gold Creek 17010304 3622	WBAGII assessment indicates cold water aquatic life supported. Sediment modeling indicates cold water use supported by sediment levels. Nutrient level indicates weed growth standard not exceeded. Temperature standard exceeded; temperature TMDL required.	Sediment modeled at < 50% of background rate; WBAGII score ? 2. Nutrients not present in concentrations causing nuisance weed or algae growth.
Harvey Creek 17010304 7576	WBAGII assessment indicates cold water aquatic life supported. Sediment modeling indicates cold water use supported by sediment levels. Monitoring of bacteria indicates full support of contact recreation. Dissolved oxygen standard supported. Temperature standard exceeded; temperature TMDL required.	Monitoring of *E.coli* indicates full support of contact recreation standard; Dissolved oxygen above cold water aquatic life standard. Sediment modeled at < 50% of background rate; WBAGII score ? 2.
Heller Creek 17010304 2017	Temperature standard exceeded; TMDL required	N/A
Hugus Creek 17010304 3600	WBAGII assessment indicates cold water aquatic life supported, but sediment modeling indicates sediment yield high; further investigation required to determine if aquatic life use is adversely affected.	N/A

Table 20, continued.

Water Body Name and HUC Number	Assessed Support Status	Reasons Segment to be Delisted for Pollutant
Loop Creek 17010304 5620	Sediment modeling indicates cold water use supported by sediment levels. Temperature standard exceeded; temperature TMDL required.	Sediment modeled at < 50% of background rate. Stream Fish Index scores high. No evidence of unknown pollutant found.
Marble Creek (Lower) 17010304 3604	WBAGII assessment indicates cold water aquatic life not supported. Sediment modeling indicates sediment yield high. Waterbody to be addressed by the 2002-2003 303(d) List.	N/A
Mica Creek 17010304 3601	WBAGII score ? 2, however, sediment modeling indicates sediment more than twice the 50% above background threshold; sediment TMDL required.	N/A
Mosquito Creek 17010304 2020	Temperature standard exceeded; temperature TMDL required.	N/A
Simmons Creek 17010304 2022	Temperature standard exceeded; temperature TMDL required.	N/A
Tank Creek 17010304 7575	Sediment modeling indicates cold water use supported by sediment levels. Monitoring of bacteria indicates full support of contact recreation. Dissolved oxygen standard supported. Temperature standard exceeded; temperature TMDL required.	Sediment modeled at < 50% of background rate; trout density and habitat index high; monitoring of *E.coli* indicates full support of contact recreation standard. Dissolved oxygen above cold water aquatic life standard.
Toles Creek	WBAGII assessment indicates cold water aquatic life not supported, waterbody to be addressed by the 2002-2003 303(d) List.	N/A

Conclusions

The TMDLs currently required in the St. Joe River subbasin are listed in Table 21. The Big, Bond, Boulder, Eagle, Hugus, Lower Marble, and Toles Creeks are not currently on the 303(d) list. Of these watersheds, those with unsatisfactory WBAGII scores will be addressed by the 2002-2003 303(d) List, while those with high sediment levels will require further investigation to determine if aquatic life use is adversely affected by excess sediment.

Table 21. TMDLs required for the St. Joe River subbasin.

Watershed	TMDL Required	Critical Flow	Boundaries of Exceedence	Critical Reaches	Key indicator
Bear/Little Bear	Sediment	Episodic high flow	Headwaters to Toles Creek	Rosgen B and C channels	Tons/year
Bear/Little Bear	Temperature	Low summer flow	Headwaters to Toles Creek	Entire length	Full potential shade
Beaver	Temperature	Low summer flow	Headwaters to St. Joe River	Entire length	Full potential shade
Blackjack	Temperature	Low summer flow	Headwaters to St. Joe River	Entire length	Full potential shade
Bluff	Temperature	Low summer flow	Headwaters to St. Joe River	Entire length	Full potential shade
Fishhook	Sediment	Episodic high flow	Headwaters to St. Joe River	Rosgen B and C channels	Tons/year
Fishhook	Temperature	Low summer flow	Lick Creek to St. Joe River	Entire length	Full potential shade
Fly	Temperature	Low summer flow	Headwaters to St. Joe River	Entire length	Full potential shade

Table 21, continued.

Watershed	TMDL Required	Critical flow	Boundaries of Exceedence	Critical Reaches	Key indicator
Gold	Temperature	Low summer flow	East Fork Gold to St. Joe River	Entire length	Full potential shade
Harvey	Temperature	Low summer flow	Headwaters to St. Joe River	Entire length	Full potential shade
Heller	Temperature	Low summer flow	Headwaters to St. Joe River	Entire length	Full potential shade
Loop	Temperature	Low summer flow	Headwaters to St. Joe River	Entire length	Full potential shade
Mica	Sediment	Episodic high flow	Headwaters to St. Joe River	Rosgen B and C channels	Tons/year
Mosquito	Temperature	Low summer flow	Headwaters to St. Joe River	Entire length	Full potential shade
Simmons	Temperature	Low summer flow	Headwaters to St. Joe River	Entire length	Full potential shade
Tank	Temperature	Low summer flow	Headwaters to St. Joe River	Entire length	Full potential shade

2.4 Data Gaps

Cumulative watershed effects data or data from an equivalent procedure for Bear, Fishhook, Harvey, and Mica Creeks would be beneficial to the sediment modeling. These data are required to better model sediment yields.

Additional temperature data is important to better understand the temperature status of all of the segments of the subbasin. Spatial temperature data would better improve the scope of temperature exceedences.

3. Subbasin Assessment – Pollutant Source Inventory

Sources of nutrients, bacteria, and dissolved oxygen demanding materials are not apparent in the St. Joe River subbasin. Sources of sediment exist in the St. Joe River watershed, including approximately 14.7 tons per square mile per year of natural background sediment. All sources of sediment are nonpoint sources. Sources of thermal input are restricted to loss of stream canopy cover.

3.1 Sources of Pollutants of Concern

Pollutant sources of sediment are discussed in the following sections. Sediment is yielded to the subbasin from a large number of sources, including natural erosion. Cattle are sources of bacteria and nutrients, but grazing is limited in the subbasin to flat fields in the lower river floodplain. Sources of dissolved oxygen demanding materials are not apparent.

Point Sources

No point sources have been permitted or found in the subbasin. The city of St. Maries wastewater treatment plant and Potlatch Corporation discharges are downstream of the subbasin.

There are no Superfund or Resource Conservation Recovery Act (RCRA) sites in the subbasin. Petroleum spills have been addressed at several sites including Avery and Red Ives.

Nonpoint Sources

The primary disturbance causing stream temperatures to rise is non-natural canopy modification by silvicultural and agricultural practices. Attainment of natural full potential canopy shade is the most that can be done to lower stream temperatures.

Nonpoint sources of sediment are primarily from silvicultural practices, especially forest roads. The majority of the land use of the subbasin is forestlands. Silvicultural features, such as road crossings and encroaching roads, are accounted for in the sediment model and are documented in the GIS coverages that were used to load the model.

Sediment sources can be described by land use category as follows:

-- The meta-sedimentary rocks of the Proterozoic Belt Supergroup yield a natural sediment rate of 0.023 tons per acre per year (14.7 tons per square mile per year). Mass wasting is not a typical feature of the terrain, but it does occur on tertiary glacial deposits. Mass wasting is directly estimated in the CWE process.

-- Timber harvest is a source of sediment, especially in the first year following the harvest, while the cut area is void of cover. Forest ground cover regenerates rapidly in open areas where new plants are not competing with mature trees. Ground cover has been observed to return to 28-50% cover the first year after a harvest and near 75% in the second year (Elliot and Robichaud 2001). Once vegetative cover is reestablished, the excess sedimentation from the harvest does not occur.

-- Timber harvest roads are a significant source of sediment. These can yield surface sediment, trigger mass wasting, or constrain streams and accelerate erosion. County and state roads, railroads, and highways can also constrain streams and accelerate erosion.

No significant sources of bacteria, nutrients, or dissolved oxygen requiring substances were found in the St. Joe River subbasin.

Pollutant Transport

Pollutant transport is only relevant to sediment. Sediment is delivered to the stream system primarily during high precipitation-high discharge events or rapid snowmelt events. These are episodic events. Under these conditions, large volumes of sediment move in the stream systems. These conditions develop stream power and stage heights capable of channel alteration. Sediment trapped in upper low order watersheds moves quickly to the higher order streams of the subbasin. Areas with a stream gradient constrained by roads have rapid erosion from the bed and/or banks. The gradient of the St. Joe River is insufficient to flush sediment larger than gravel and cobble from the stream channel below Calder. A sediment transport model is not available for the St. Joe River.

3.2 Data Gaps

The major data gap in temperature pollution is monitoring data from the entire length of the stream. The major data gap in sediment pollution is not related to the sources, but is related to in-stream measurements of load and transport of sediment.

Point Sources

No point discharges of sediment, heat, nutrients, bacteria, or oxygen demanding materials have been documented.

Nonpoint Sources

Nonpoint sources of sediment have been modeled rather than measured. In-stream monitoring of the sediment load would be of value. Such monitoring is quite expensive (see Section 2.3, page 28 in DEQ 2001). It is unlikely that this data gap will be filled. Model results are the best available information.

Current temperature data are from in-stream monitoring at set locations. Thermal imaging that provides a view of stream wide temperatures would be of value. Such imaging is expensive.

4. Subbasin Assessment – Summary of Past and Present Pollution Control Efforts

The Idaho Forest Practices Act governs the harvest and reforestation of all timberlands in Idaho. These rules are, in part, best management practices designed to abate erosion and retard sediment delivery to the streams. The IDL has implemented the act's rules and regulations aggressively over the past 14 years. The timber industry and state have worked cooperatively to acquire the Milwaukee Railroad grade and convert the grade into a high quality road along the St. Joe River. Upgrading and paving the road has lessened sediment delivery to the river from this source.

All USFS harvests must meet INFISH (the federal Inland Native Fish Strategy) guidelines. These guidelines prescribe 300-foot wide buffers for streams with fishery uses. The USFS has relocated and obliterated roads in the subbasin. The USFS also decommissioned 50 miles of road in the Bird and Eagle Creek watersheds. An additional 26 miles of roads have been decommissioned in the North Fork St. Joe, Marble, and Fishhook watersheds. Another 20 miles of road decommissioning or removal is currently planned for the Marble, Loop, Bird, and Eagle Creek watersheds. In the past six years, 155 miles of road removal, decommissioning, and closure has occurred in the Simmons, Gold, Loop, Boulder, and Marble Creek watersheds.

The primary land managers of the St. Joe watershed are the USFS and the timber companies, Potlatch Corporation and Forestry Capital, Inc. Road inventories have been developed in and around timber sale areas for several years. The USFS and Potlatch Corporation have inventoried timber stands and the road systems. This information is available in interactive GIS format. In this form, the stand and road inventory information is available to pinpoint problem sites. Road removal projects and stream crossings requiring remediation can be given priority.

Potlatch has a watershed study in Mica Creek designed to identify impacts of past and current timber harvest. The study has been in progress for nearly nine years. Specific road removals and road crossing projects have been implemented to assess the benefit of these actions on the watershed.

Agricultural practices in the subbasin are livestock grazing and some hay land harvest. These occur almost exclusively in the bottomland along the lower St. Joe River. This land is essentially flat. The Benewah Soil and Water Conservation District has completed 14,790 feet of stream bank erosion abatement projects on the St. Joe River between the towns of Calder and St. Maries. The district has another 8,560 feet ready for implementation.

The USFS has completed 10 acres of riparian enhancement through vegetation planting. Stream enhancement structures have been placed at 115 locations in Heller, Big, Loop, Cedar, and Eagle Creeks. Petroleum spills have been addressed at several sites with leaking underground storage tanks, including Avery and Red Ives. All known petroleum spill sites in the St. Joe River subbasin have been addressed.